

MUNICIPAL RURAL AFFAIRS,  
Ministry of 1978

Southern Region Project Study.  
Master Plan report - Jizan.

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Population Distribution in Jayam District by emirates  
& their capitals

سكان منطقة جيزان موزعين حسب الامارات ومراكزها

الا	عدد السكان		مركز الامارة	عدد السكان		الامارة
	الجملة	اناث		ذكور	اناث	
١٦	٣٢٧٩٢	١٥١٢٧	جيزان	٣٢٧٩٢	١٧٦٦٥	جيزان
١٧	١٣٤٦٢	٦٨٤١	صبيا	٦١٢٩٢	٢٩٨٧٨	صبيا
١٨	١٢٢٧٢	٦٢٦١	ابو عريش	٣٣١١٤	١٦٢١٩	ابو عريش
١٩	١٢٠٣	٥٣٥	الريان	١٤٦٤٦	٧٢٢٢	وادي جيزان
٢٠	٣٣٥٤	٦٤٤١	الثقفي	٢٢٢٥٦	١٠٨٢٣	ضمد
٢١	٦٢٤٦	٣٣٢٣	بيش ام الخشب	١٠٧٧٩	٥١١٩	بيش
٢٢	١٣٩١	٧٣٥	مسلمية	٤٥٩٨	٢١٩٩	مسلمية
٢٣	١٨٧١	١٠٠٧	العالية	٦٤٢٤	٣١٣٧	العالية
٢٤	٢٥٧	١٣٤	عتود القوم	٢٢٤٩	٣٣١١	عتود
٢٥	٢٥٨١	١٠٣٣	درب بني شمبة	٨١٢٤	٤٥١٠	درب بني شمبة
٢٦	٩٣٥	٤٧٨	الثقفي	٤٨٠٠	٢٤٦٦	الثقفي
٢٧	١٠١٦	٥٠١	القحمة	٣٢٤٧	١٢١١	القحمة
٢٨	٥٥٨	٢٤٨	رضيفة	٧٨٤١	٤١٠٠	الريث
٢٩	١٣٢٨	٧١٠	الحقو	٣٥٥٨	١٦٨٤	الحقو
٣٠	٤٤٥	٢١٤	الثرف	١٤٠١١	٦٧٣٥	مروب

سكان منطقة جيزان موزعين حسب الامارات ومراكزها

الجملة	عدد السكان		مركز الامارة	عدد السكان		الجملة	الامارة	الجملة
	اناث	ذكور		اناث	ذكور			
٤٣	١٢	٣١	المرجلة	٢٩٥٠	١٤٨٩	١٤٦١	الحشر	٣٢٧٩٢
٣١٠	١٥٦	١٥٤	عبيان السوق	١٠٣١٤	٥١٧٤	٥١٤٠	بلغيازي	١٣٤٦٢
٦٤	٢٥	٣٩	التفيمعة	١٢٣٢٢	٦٦١٦	٦١١٦	فيفا	١٢٢٧٢
٢٢٥	٩٧	١٢٧	الداير	١٤٧٣٣	٧٥٣٨	٧١٩٥	بني مالك	١٢٠٠٣
٦٧	٥١	٣٥	الربووعة	٣٣٢٩	٧١١١	٢١١١	الربووعة	٣٣٥٤
٢٠٢٦	١٠٢٤	٩٩٢	العارضه	٢٩٢٩٣	١٤٧٤١	١٤٤٣٣	العارضه	٦٢٤٩
١١١	٥٥	٦١	المجازيع	٧٠٤	٤١٣	٣٩١	بني قيس	١٣٩١
١٠٥٣	٤٧٣	٥٧٢	الغوربة	٢٠٩٦٠	١٠٠٩٧	١٠٠٦٧	الغوربة	١٨٨١
٧٠٠٣	٣٥٥٦	٣٤٤٧	صامطة	٣٧٣٩٠	١٩٦٠٢	١٧٧٧٧	صامطة	٢٥٧
٢١٥٩	٨٢٩	١٣٣٠	الطوال	١٠٧٨٩	٥٢٤٥	٥٤٤٤	الطوال	٢٥٨١
٢٧١٠	١١٤٤	١٥٦٦	مركز المساحة (الاحد)	٢٤١٧٨	١٢٤٥٩	١١١٧٩	الاحد	٩٢٥
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١٩٢٠	٦٥٧	١٢٦٣	الموسم	٤٤٣٣	١٧٦٥	١٧١٤	الموسم	٥٥٨
١٣٤٥	٧١٥	٦٣٠	فرسان	٣٢٥٠	١٧٢٠	١٦٣٠	فرسان	١٣٢٨
١٠٠٢٠١	٤٨٢٩٦	٥١٩٠٥	جملة مركز الامارة	٤٠٨٣٣٤	٢٠٥٦٨٩	٢٠٣٦٤٥	جملة المنطقة الادارية	٤٤٥

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SOUTHERN REGION PROJECT STUDY

MASTER PLAN REPORT

JIZAN

## PREFACE

It is our great honor and pleasure to have the opportunity to participate in the studies of the regional master plan for the Southern Region and master plans for the main cities of the Southern Region in the Kingdom of Saudi Arabia.

Our participation in the project was initiated in May 1974. Since that time, under the guidance of the Ministry and with close collaboration between our offices in Tokyo and Abha, we have done our utmost to carry forward our task.

This report presents the final results of our study for the preparation of master plans for the five main cities and a village cluster in the Southern Region. The series of six reports of which this is a part represents the work of the third phase of the third stage of the Southern Region Project Study as specified in the Agreement.

The development plans contained in this report have been based on the Existing Conditions Reports, the Initial Appraisal Reports, the Alternative Strategies Reports, and the Preliminary Master Plan Reports, all of which have been previously submitted to the Ministry of Municipal and Rural Affairs. The development plans have been formulated in line with the major objectives, policies and priorities adopted by the Ministry.

The development plans cover the anticipated growth of the five major cities and the village cluster, proposed land uses, infrastructure planning, and outline programs of development, land acquisition, improvement, and zoning regulations.

We therefore submit these reports as the final Master Plans of the main cities and the village cluster in the Southern Region.

1978

Kenzo Tange

Project Principal

#### ACKNOWLEDGEMENT

In the process of the preparation of this report, valuable assistance has been given to us by numerous governmental organizations and officials. In this regard, we would like to express our particular and sincere gratitude to those listed hereunder for their kind suggestions and guidance on our progress of the study.

H.R.H. Prince Magid Ibn Abdul Aziz  
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H.R.H. Prince Khalid Ibn Faisal Ibn Abdul Aziz  
The Governor of Asir Province

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The Deputy Minister for Town Planning

H.E. Dr. Abdelbaki Mohammed Ibrahim  
The U.N. Chief Advisor--Regional and National Physical Planning Project

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H.E. Abdul Aziz Mohammed Abu Melhah  
Director General of Municipal and Rural Affairs--Southern Region

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The Assistant Director General of Municipal and Rural Affairs--  
Southern Region



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1. introduction

1-1 SCOPE OF REPORT

The series of six reports of which this is a part presents the Final Master Plan for the five major cities and a village cluster in the Southern Region. The report reviews all the significant information on the existing conditions, presents future projections, and a physical Master Plan which outlines the development of the cities and the village cluster for the twenty-year planning period from 1975 to 1995. The report also contains a development strategy for the phasing of the plan and recommendations for an implementation program from which a capital investment program is prepared.

of the Southern Region. The master plan contains the basic strategy for the growth of the city of village cluster, the recommended directions for the change in population, the functional distribution of land use, infrastructure development, and policies toward the nomadic population. The community structure, on the other hand, identifies a hierarchy of population groupings in order to properly distribute urban services and to help establish identifiable communities. The "neighborhood" of approximately 4000 residents is the basic unit of social organization and provides a logical definition of planning districts for which projections and identification of needs may be established.

1-2 PLANNING PROCESS

1-2-1 RELATIONSHIP OF THE FINAL MASTER PLAN TO PREVIOUS REPORTS

During the course of the Southern Region Project Study, a series of five separate reports have been submitted for each of the five major cities of the Southern Region. "Initial Appraisal of Existing Conditions" and "Immediate Action" identify areas requiring immediate attention, while "Existing Conditions" and "Alternative Strategies" focus on broader issues confronting the cities and on various alternative approaches toward meeting long range planning objectives. The Preliminary Master Plan drew on all four previous reports and presented a program for the development of the city over the twenty-year planning period. These Final Master Plans were prepared based upon comments and criticism given by the Ministry and its advisers and represent a set of workable plans which respond to all the comments received by the consultant.

1-2-2 ELEMENT BY ELEMENT ANALYSIS

The various considerations affecting urban development have been classified into various "Planning Elements." Each planning element is a collection of highly interrelated topics which can be investigated in great detail and in relative independence of other elements. Taken together, however, the elements encompass an exhaustive list of issues involved in the formation of development plans. The element by element study makes possible a clear identification of trends, needs, and problems which must be addressed by the master plan.

1-2-3 COORDINATION OF PLANNING ELEMENTS

There is, at the same time, a systematic coordination of Planning Elements through the recommended Schematic Master Plan, developed in Alternative Strategies reports, and through the establishment of a "community structure," indicated by Planning Standards in the Preliminary Physical Master Plan

Planning Element	Chapter
Housing	3
Industries	4
General Education	5
Public and Institutional Facilities	5
Cultural Facilities	5
Commercial Facilities	5
Recreation and Conservation	6
Transportation	7
Public Utilities	8

1-2-4 FLOW OF INFORMATION

For each Planning Element, first, the existing conditions are briefly reviewed. Next, the projections of populations developed in Chapter 3 and economic projections developed in Chapter 4 are applied to in the context of the Planning Standards. As a result, future requirements or projections for a particular Planning Element may be obtained. Third, a policy which will determine land use for the element is developed by considering the schematic master plan, the community structure, and the Planning Standards. The application of policy principles results in the element land use plan. Site considerations and local issues are discussed at this stage. The recommended overall development plan, or the Master Plan, is generated from the simultaneous consideration of all the individual element land use plans. Phasing, zoning and legal framework, and recommendations for a capital investment program are developed from the Master Plan.

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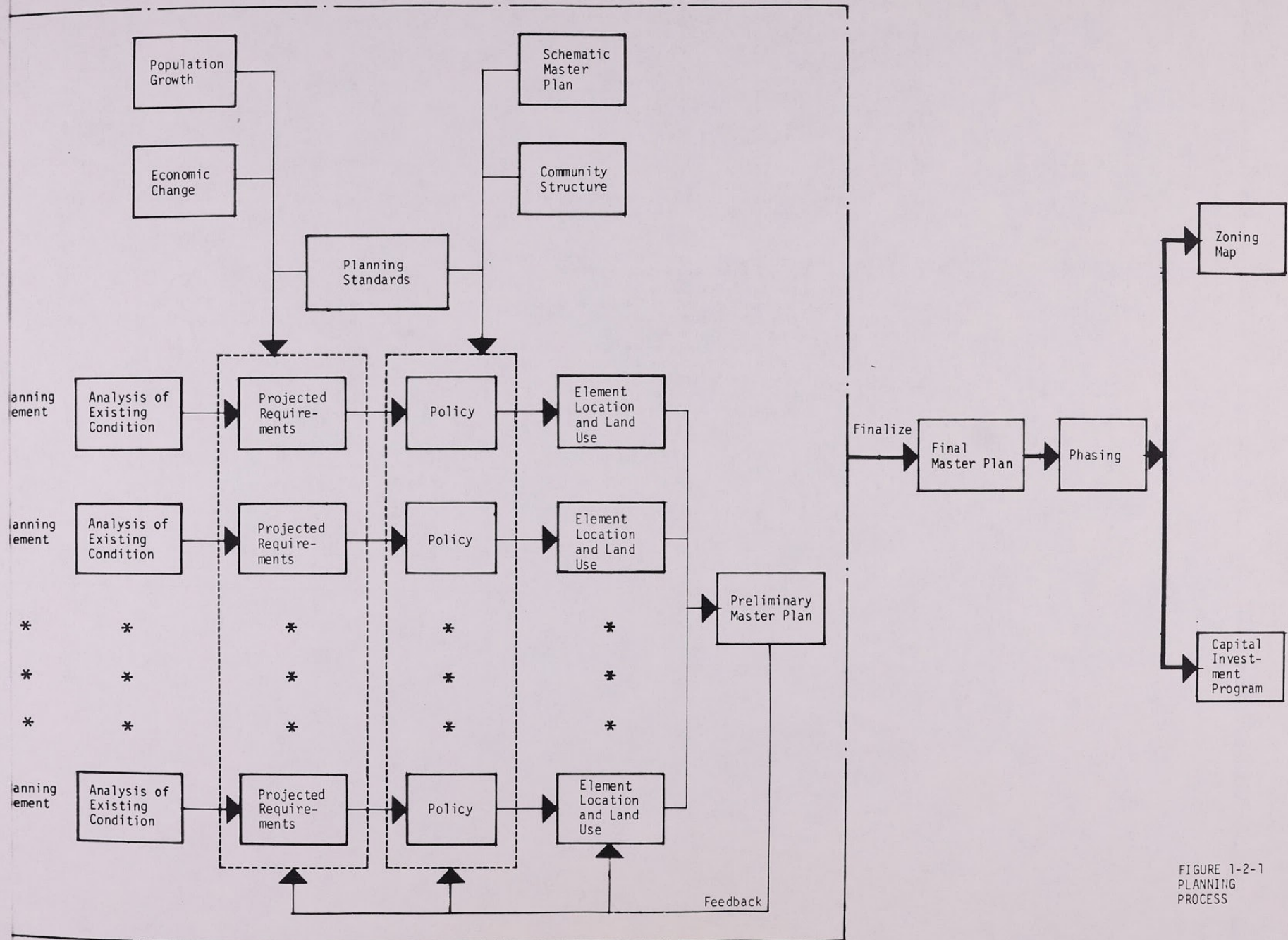


FIGURE 1-2-1  
PLANNING  
PROCESS

1-2-5 FEEDBACK

Throughout this entire process, constant feedback assures comprehensive and coordinated planning. Policy principles affect future requirements; the Master Plan influences the development of policy principles; and phasing, legal, and financial issues alter the Master Plan. The development plan discussed in Chapter 9 is a result of numerous studies leading from the existing conditions, to projections of requirements, to the Master Plan, and to phasing, legal, and financial considerations and back to projection of requirements. The process was repeated until all the requirements and policy principles could be satisfied in a consistent and comprehensive Master Plan.

1-2-6 FUTURE FEEDBACK

It must be very strongly emphasized that this master plan (as should be the case with any master plan) must be implemented in a way which allows a substantial amount of modification in the future should conditions change in unforeseen ways or should future planners feel that compelling reasons exist to alter certain aspects of the plan. Such adaptability is especially important when very rapid development is expected as is the case with every major area of Saudi Arabia.

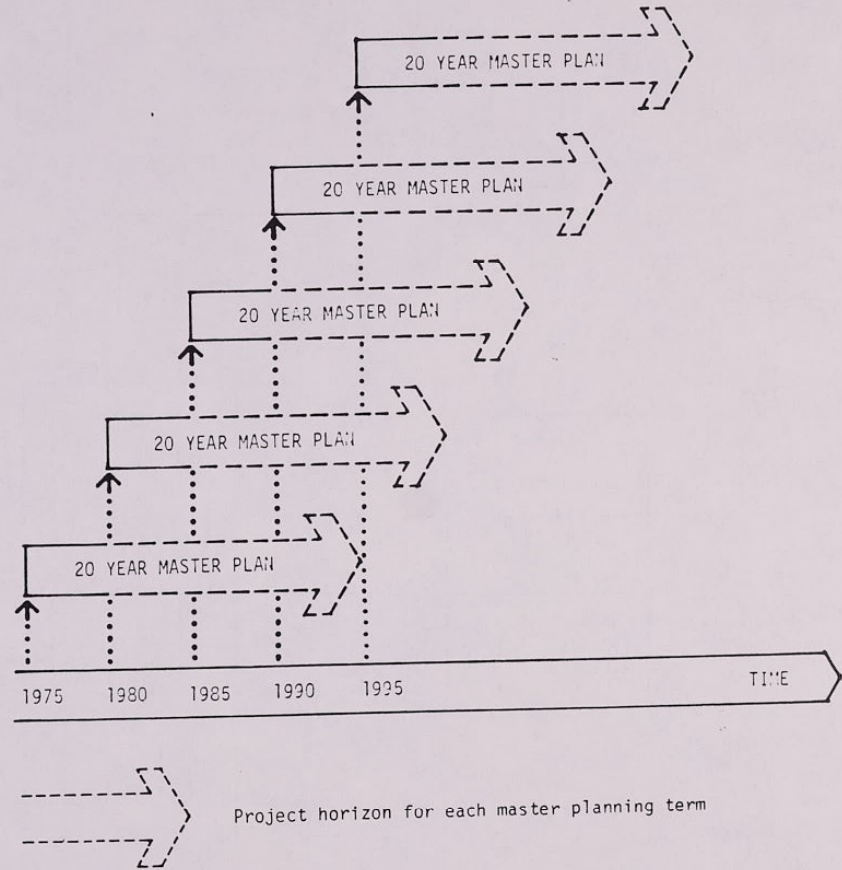


FIGURE 1-2-2  
DIAGRAM OF  
MASTER PLAN  
OVER TIME

FIGURE 1-2-3  
REGIONAL  
LOCATION  
scale 1:2,000,000

NOTE:  
For definition of sub-regions and  
wadi basins, see Southern Region,  
Physical Plan, Chap.3



TIME

FIGURE 1-2-2  
DIAGRAM OF  
MASTER PLAN  
OVER TIME

— sub-region  
- - - wadi basin





2. summary of existing conditions

2-1 REGIONAL POLICIES  
AND THE CITY

The city of Jizan is situated at 16°53' N latitude and 42°33' E longitude on the coast of Tihama plain south of Wadi Jizan, where the marshy salt flats extend along the Red Sea. The Tihama sub-region extends across the entire coastal area of the Southern Region. The population of the sub-region is 376,600, and Jizan, 22,160. The intent of the government's regional policies is to stimulate the development of the sub-regions of the Southern Region according to their resources and potentialities. In particular, regional policies to develop the city of Jizan have been as follows:

1. to expand the Jizan port so that commerce and transport functions can be increased there;
2. to expand the Jizan port so that it can serve more effectively as an entrance to the Southern Region and the Kingdom;
3. to further exploit the potential of Jizan as an agricultural distribution center for the Southern Region; and, more generally,
4. to develop the city of Jizan in such a way as to facilitate the development of the Tihama sub-region, and the entire Southern Region.

Recently it has been proposed by the government to partially relocate the activities of Jizan to a new site which is approximately 8 to 15 km from the existing city. As a result, policy items 3 and 4, as noted above, may be more closely associated with the new Jizan than the existing Jizan. For a further discussion related to relocation see Sec. 2-6 of this report.

2-1-1 DEFINITION

The following terms are employed in this report to identify the various parts of the city of Jizan:

1. "Old Jizan" refers to the oldest and the most densely populated area of Jizan, located in the northern coastal flats of the Jizan promontory. Old Jizan corresponds to URTEC 5% Survey districts I-1 through I-6 [1] and to Land Use Enumeration Blocks 1 through 14 and 30 [2].
2. "Existing Jizan" or sometimes simply "Jizan," without any qualifications, refer to the entire promontory of Jizan, including the Old Jizan and the currently vacant lands formerly occupied by the Ministry of Defense. Existing Jizan corresponds to the planning area as defined in Fig 3-1-13 and represents the primary focus of this report.
3. "New Jizan" refers to the new city proposed by the government. Many of the resident population and urban activities will be relocated from the Existing Jizan to the New Jizan during the project period of this Master Plan.
4. "Combined Jizan" refers to the combined city

consisting of Existing and New Jizan. In the future, Combined Jizan should be considered as a single metropolitan area.

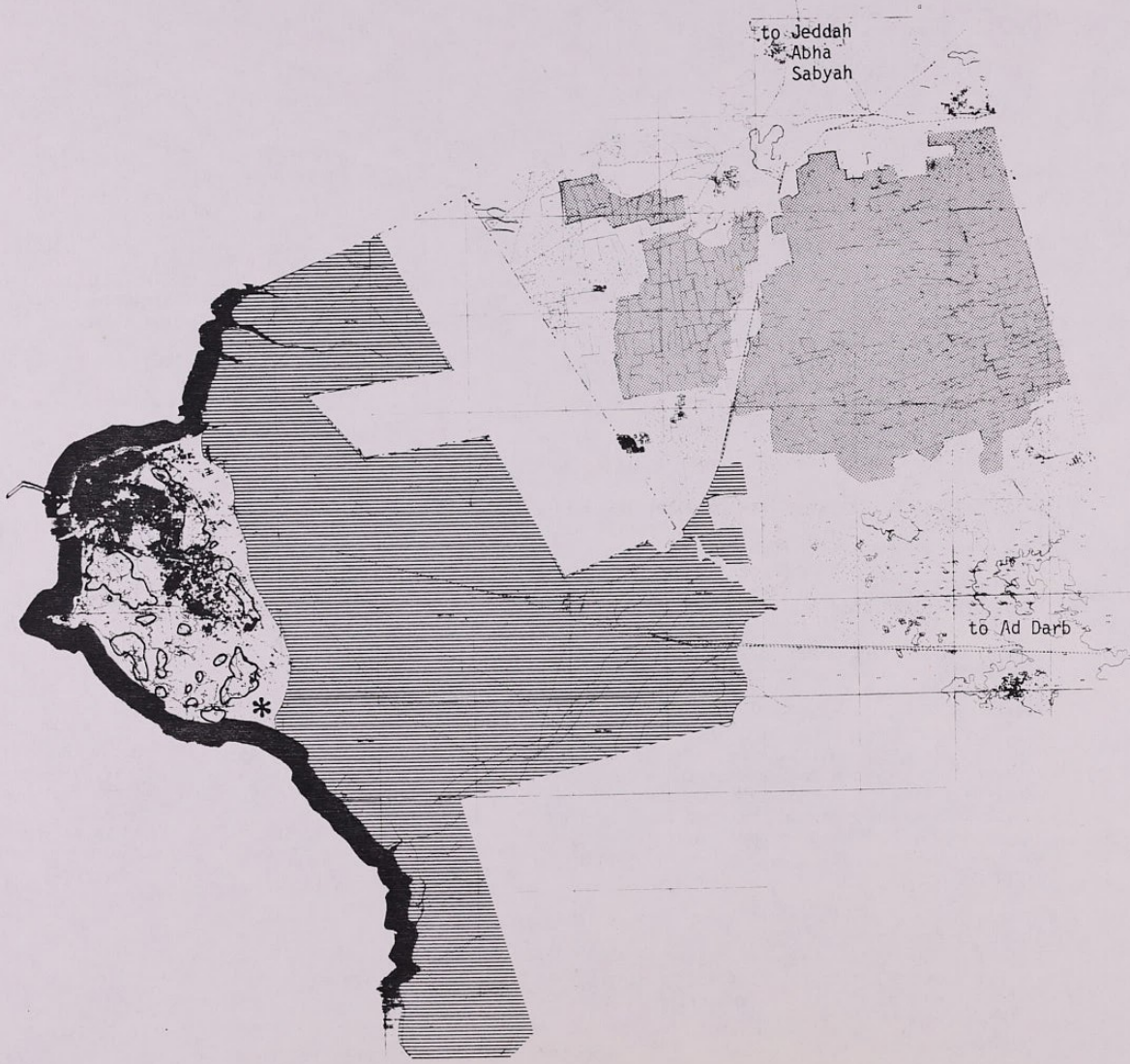
2-2 MAIN FUNCTIONS OF  
THE CITY

- The main functions of the city of Jizan may be classified into three principal types of activities:
1. Functions of Jizan as the capital of Jizan Province and economic center of the Tihama sub-region:
    - a. Administration
    - b. Collection and distribution of such agricultural products as tomatoes, eggplants, and lady fingers to the Southern Region
    - c. Distribution of goods imported from outside the sub-region
    - d. Business and finance
    - e. Industries
  2. Functions of Jizan as the only major port of the Southern Region:
    - a. Transportation center for the coastal area of the Southern Region.
    - b. Entry port for Yemeni and other foreign workers
    - c. Petroleum reservoir and distribution
    - d. Potential recreational and resort activities on the Farasan Islands.
  3. Functions of Jizan as the cultural and social service center of the Tihama sub-region:
    - a. General education.
    - b. Higher and special education.
    - c. Health care, including treatment and research of endemic and epidemic diseases.
    - d. Cultural and historical research, including sites in the Tihama.

Jizan is the governmental and commercial center of Jizan Province. Emir's Offices and branches of various ministries are located in the city for the administration of the province. The markets in Jizan collect agricultural produce from the lower Tihama plain extending toward the border of Yemen and distribute them to major consumer markets in Abha, Khamis Mushayt, Jeddah and other areas as far away as Riyadh, Qatar and Kuwait. The city also exports fish to Abha, Khamis Mushayt and Najran.

Jizan is a major port of entry for foreign workers from Yemen, East Africa, and Asia destined not only for the Southern Region but also for the major urban centers of the Kingdom. Recently, with the construction of a petroleum reservoir plant, Jizan has become a major supplier of petroleum in the Southern Region.

FIGURE 2-1-1  
SURROUNDING  
AREA  
scale 1:50,000



SOURCE:  
Existing Conditions, Vol.I,  
Table 3-1-15, Percentage Composition  
of Households by Income and District,  
and Fig.3-1-6, Household Income by  
District

- 1 High income district : Share of households with income of SR.2001 or more per month exceeds 15%
- 2 Medium income district: Neither high nor low income district
- 3 Low income district: Share of households with income of SR.500 or less per month exceeds 55%

- steep hill
- salt flat
- agricultural area
- airport
- damaged building area
- petroleum reservoir
- seaport

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Existing Jizan presently fulfills all three types of functions. After the proposed relocation, however, the principal functions of Existing Jizan will be limited to those in the second category, i.e., functions of Jizan as the only major port of the Southern Region. The first and third categories of functions will be carried out in the New Jizan. In order to insure that Existing and New Jizan will act as one metropolitan area to fulfill all the categories of functions, it is essential that the two areas be closely linked by efficient communication and transportation and that the activities of the two areas supplement one another.

### 2-3 HISTORICAL GROWTH AND NATURAL FEATURES

#### 2-3-1 HISTORICAL GROWTH AESTHETIC AND ARCHITECTURAL CHARACTERISTICS

Jizan as a seaport had always been a minor trade center. Its economy has traditionally been based on the natural resources in its immediate vicinity: pearls from the sea and rock salt from nearby mines. Given its location atop a rocky ledge that high tides encircled with water and its accessibility to the Farasan Islands and the population centers of Tihama, it is surprising that Jizan did not develop into an important seaport.

For the longest time, the lack of water restricted Jizan's growth potential; the only source of water in the vicinity are wells located about three and one-half miles inland to the northeast. This handicap prevented the city from capitalizing on its favorable growth potential.

Houses in Jizan include both stone and mud brick construction. A stone fortress commands the entrance of the port. Because of the fire hazards resulting from the perennial water shortage, Amir Khalid Al Sudairi ordered in 1942 that from that time on only stone buildings could be constructed. However, a new crisis developed after a new water pipeline system was introduced. Because the improved water supply was not matched by an adequate drainage system, foundation problems developed that brought many housing structures down every year.

In general, the previous settlement pattern in Jizan was characterized by:

1. Densely urbanized areas were restricted to low-land areas close to the port and fishing harbors, roughly within a circular area with a 500 meter diameter.

2. Outside of this area, only small structures were seen scattered in the southeast direction.

The existing pattern can be described in relation to the previous one as follows:

1. The densely settled area has been extended toward the southeast direction, a natural direction of growth from the topographical point of view.
2. The densely settled area has expanded roughly twice during the period.
3. At the same time, the density of structures in the old city area has also increased.
4. Little change has taken place outside of the presently densely settled area.

The indigenous architecture of Jizan is represented by round huts made of mud bricks [3]. Rectangular ancient houses and Moroccan type courtyard houses can be found in various parts of the city. The most prevalent building type is a combination of various elements, mainly huts and other structures located in a compound surrounded by reed and mud fences. These houses are unique in the Southern Region and provide a characteristic, visual aspect of the city. Efforts should be made to preserve some of these structures, converting them into non-residential uses.

#### 2-3-2 NATURAL FEATURES

The average altitude of Jizan is around 50m above sea level. The present town is concentrated on the northern end of a promontory. It is surrounded on three sides, north, south and east by coastal salt flats that are just above normal high tide levels. Behind the city the terrain rises slowly to the east until it reaches the foothills some 50 km from the coast.

##### 1. Climate:

Annual mean air temperature in Jizan is 30.8° C, ranging from 26.0° C in January to 34.3° C in July. While rain falls almost every month, most of Jizan's rainfall occurs during the winter months. Generally, there is little rainfall in the coastal strip, but rainfall frequencies increase inland toward the mountains. Maximum values of evaporation and solar radiation are rather high as compared with other sites. The relative humidity is regularly high, averaging 65% over the year.

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THE RED SEA



FIGURE 2-3-1  
GROWTH OF  
THE CITY  
1964-1975.  
Scale 1:20,000

urbanized area, 1964  
urbanized area, 1975

SOURCE:

- 1 Geographical Map, Ministry of Interior for Municipal Affairs, 1964
- 2 URTEC Field Survey and Geographical Map, Ministry of Municipal and Rural Affairs, 1975

For further information, see Existing Conditions, Vol.II, Fig.1-1, Urban Development

2. Wind:  
The predominant wind direction from May to September is northwest. During the remainder of the year, the winds are from south by south-east. Monsoon winds occur mainly between June and August and bring sandstorms to the city. Annual mean wind speed is 8.3 km/hr., and the highest monthly mean speed is 11.2 km/hr. in July.
3. Tides and ocean currents:  
Tides near Jizan are caused by oscillation of the Red Sea. When it is high tide at the northern end of the Red Sea, it is low tide at the southern end; when it is high at the southern end, it is low at the northern end.

Since the Red Sea is almost land-locked, water levels are more seriously affected by meteorological changes and evaporation. Thus, while the normal tidal change near Jizan is around 0.80 meters these factors can reduce this change by 0.30 meters, resulting in summer tides of approximately 0.50 meters.

Currents in the Red Sea generally flow parallel to the coast line, moving northwest in winter and southeast in summer. However, due to offshore islands, many reefs and uneven bed profile, there are local variations in the currents, causing sudden rips and eddies.

### 2-3-3 GEOLOGICAL CHARACTERISTICS

The geology of Jizan is of the Baid formation overlaid by a deposit of quaternary gravel, sand, and silt. The promontory on which a great part of the city is located is formed by a dome of salt mud plug thrust up through the weak part in the Baid formation. Through the layer of porous sand which occurs on the surface, the plug has up-tilted the overlying rock formations of anhydrite and gypsum hills at the outside boundary in the western and eastern sides of the promontory. Because of the sensitivity of these rocks in the western part of Jizan to contact with tidal water, many holes are created in the steep faults and folds caused by the upthrust. Many of these holes are found on the ground surface at the north-eastern side of the promontory.

The geological characteristics of the Tihama plain near Jizan are described in Fig. 2-3-2 (a). Large areas of cultivated lands are found along Wadi Jizan and Wadi Boysh, between the coast and the foothills. A detailed investigation of the soil conditions of the city was undertaken by Rhein-Ruhr Engineers for the Ministry of Municipal and Rural Affairs [4]. Some critical data have been reproduced in Fig. 2-3-2 (b) along with

the contour map of the city.

Three principal layers of soil may be identified in the coastal area and the hilly terrain of the promontory:

1. Sandy stratum, 0 to 13 m thick, of fine to medium sand partly containing silty fine particles is located in the top later.
2. Weathered stratum, 0 to 10 m thick, of fine to coarse and partly gravelly materials, interspersed by marine deposits or salt, is found below the sandy stratum.
3. Rigid stratum of solid subsoil, consisting of salt sone and rocky unweathered sediments, is found at depths not exceeding 20 m.

The three layers were identified at varying depths on the promontory.

The most serious manifestation of the geological condition of the city is a large number of houses which are damaged by local subsidence or uneven settlement. The distribution of such houses is concentrated principally along a zone extending from south of the town square near the pier to south of the large Emir's office of the east side of the coastal flat area. There is also a group of damaged houses northeast of the hill with a Turkish fort. It has been theorized that there is a correlation between the sub-surface morphology of the weathered and rigid strata and the probability of subsidence or uneven settlement. Surface soil is more likely to slip when load is placed on those areas which have an uneven layer of weathered or rigid strata.

There are, however, other immediate causes of subsidence. Sink holes in the weathered stratum may collapse because of high underground water tables and heavy surface loads. Leakages from water pipes, flooding without drainage, of surface discharge of sewage can affect the bearing capacity of soil and cause uneven settlement. Buildings on both sides of a street can be observed leaning toward the street for these reasons.

The ground water in the coastal flat area has been found contain high levels of sulphate and magnesium, resulting in concrete and steel aggressiveness. Near the existing settlements, the ground water also contains large amounts of ammonium, indicating contamination from sewage and increasing the aggressiveness. The use of metal water pipes in such areas has led to deterioration of the pipes and water leakages.

It is recommended, therefore, that:

1. Adequate sewage and drainage systems be immediately installed in the coastal flat area.

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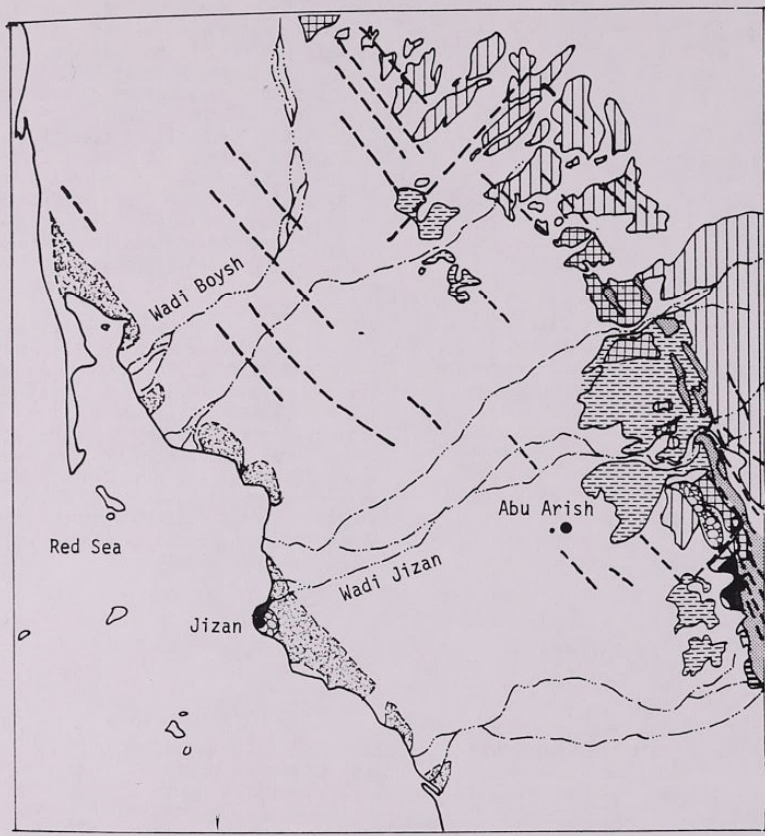
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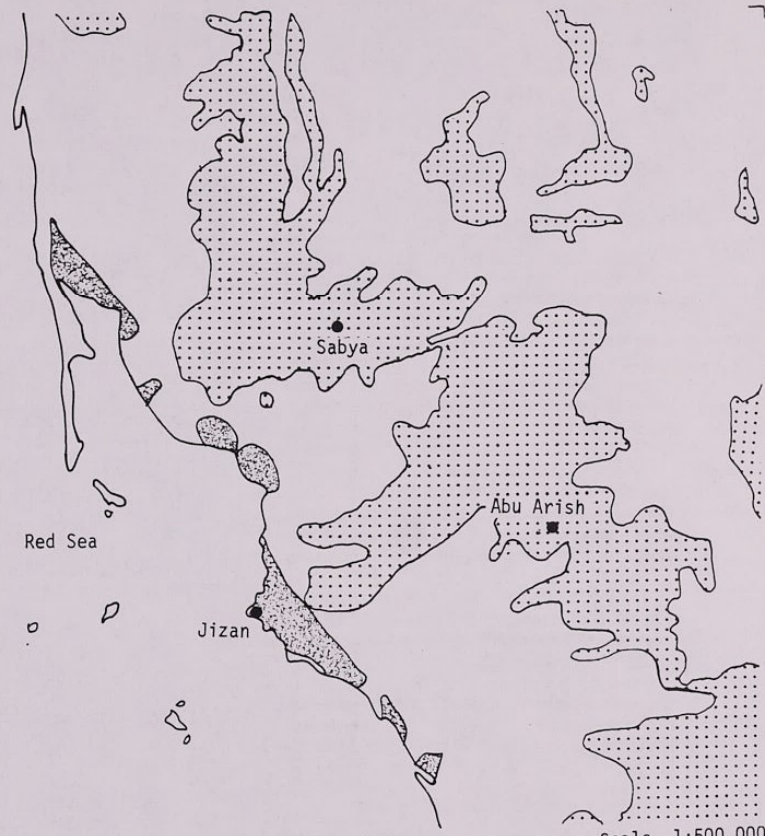
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GEOLOGICAL MAP

Scale 1:500,000

- Wadi
- Fault
- Quaternary
- Olivine Basalt (Plioc)
- Baydformation (Silicite)
- Old Basalt
- Andersite and Diabase (Miocene)
- Rhyolite/Salt Flat
- Hanifa Formation
- Khums Formation
- Basement
- Agricultural Land



GIOGRAPHICAL MAP

Scale 1:500,000

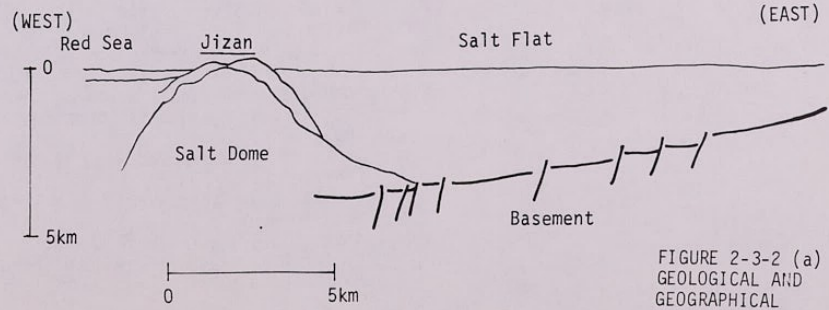


FIGURE 2-3-2 (a)  
GEOLOGICAL AND  
GEOGRAPHICAL  
FEATURES

2. The existing network of water pipes be examined and replaced as necessary.
3. In general, no new construction be located in the coastal flat area before substantial land improvement and installation of area-wide utility systems are carried out.
4. Future developments should be directed away from the northern part of the promontory to the south and the southwest. The only large undeveloped area is the open, hilly terrain in the south. Future growth of the city should be directed toward this area.

The geological characteristics of Jizan have the following implications for the future physical development of the city:

1. Bearing capacity of soil and building foundation.

In order to construct one or two story buildings, relatively simple and shallow compaction will be required, i.e., one or two meters in depth. In order to construct multi-story buildings of three or more stories, either compaction by vibroflotation or compaction by replacement with noncohesive soil will be necessary. Pile foundations resting on the rigid stratum will also be acceptable.

It is clear from Fig. 2-3-2 (b) that the depths of the surface stratum in the promontory has a side variation, with no discernible relationship to the surface contour. Thus additional studies will be required to determine the exact bearing capacities of specific location. In any case, compaction under building foundations will be necessary, and construction of multi-story buildings will require substantial effort and investment.

2. Ground Water.  
Ground water level is very close to soil surface in the lower areas of the city, e.g. east of Route 54. On the other hand, the soil investigation study reported no ground water up to 10 meters below grade in the hilly area of the former military land south of Old Jizan. High ground water table makes drainage extremely difficult, creating possibilities of uneven building settlements. Thus, it is recommended that the lower areas of the city be kept free of residential construction.
3. Topography.  
South of Old Jizan and west of the salt mine reserve designated by the Ministry of Petroleum and Mineral Resources is a large hilly area formerly occupied by the Ministry of Defense. In order to avoid the drainage problems of the Old Jizan, future development of the city should be directed toward this currently

#### 2-3-4 SALT DOME

vacant hilly area. Before developing an infrastructure network in this area, however, it will be necessary to carry out rough grading and compaction. In this regard, the following observations may be made:

- a. At present there is almost no development in this area, hence it is relatively easy to level the ground.
- b. Compaction will be required for all structure to be built in this area.
- c. In the process of an area-wide grading operation, sewer lines and stormwater drainage should be installed at the same time as the street. This will facilitate a rapid and organized development.

As indicated in a schematic section in Fig. 2-3-2 (a), Jizan is located on a salt dome covered by a terrain of anhydrite and gypsum hills. Approximately in the middle of the promontory, between the two sets of hilly areas, is a salt mine reserve land designated by the Ministry of Petroleum and Mineral Resources. Drilled reserves in the upper layers of the mine are estimated at 33.5 million tons [5], and each additional 10 m would add some 8.4 million tons of 96% grade salt. These reserves are under only 1.5 m to 21.3 m of loose sand and rock.

#### 2-4 STRUCTURE OF THE CITY

##### 2-4-1 LAND OWNERSHIP

In the developed north-western part of the city, land is privately owned. However, in the undeveloped south-western region of Jizan there exists a former military zone which is owned by the government. Public ownership of this land should greatly facilitate the implementation of plans for developing the south-western area of Jizan.

##### 2-4-2 EXISTING LAND USE

Two most remarkable features of the distribution of land in Jizan are that Jizan has no agricultural activities in and around the city, and that its military zones are located adjacent to the built-up area.

The distribution of residential areas is steadily expanding in the south-eastern direction. In the older residential areas of the north-west half, there are still many houses of hut. Also, in the south-east half, areas with huts are extensively identified. These areas are rather newly ar-



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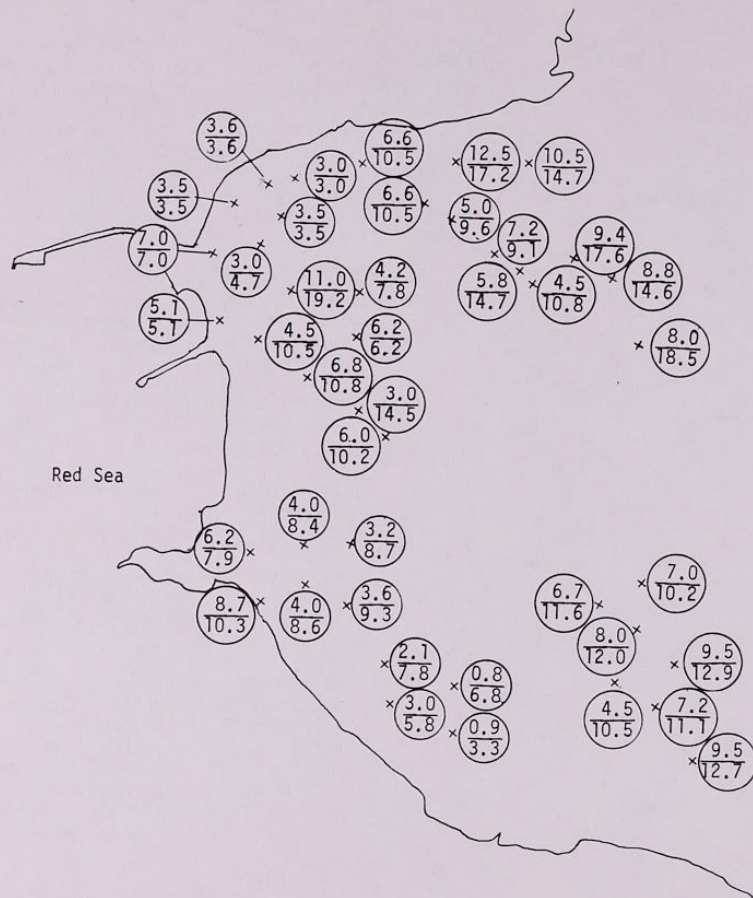
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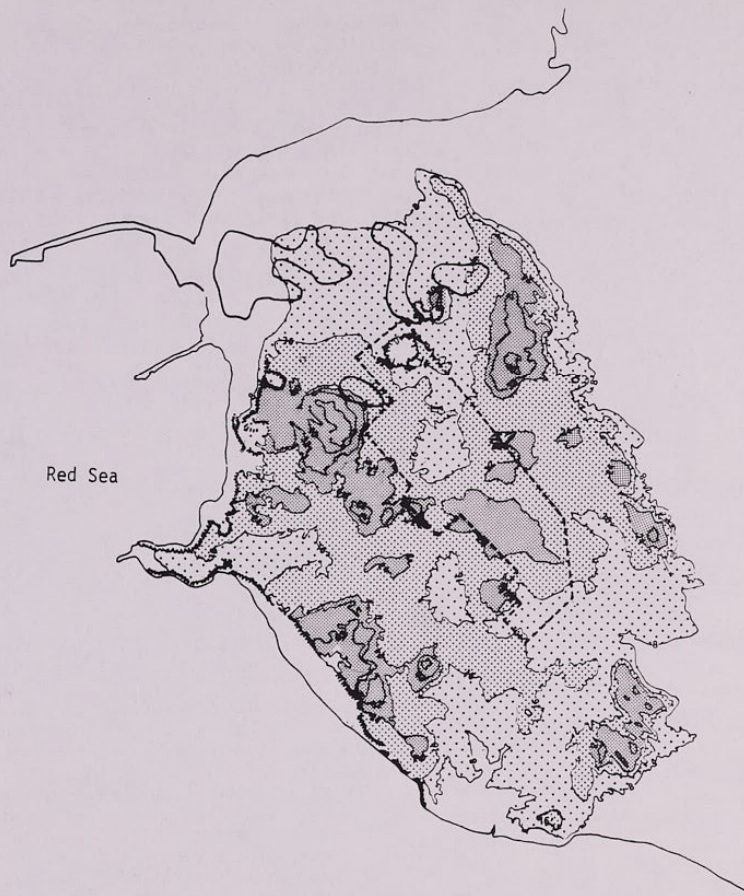
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Horizontal lines: less than 8m above mean sea level  
 Stippling: 8m - 16m  
 Vertical lines: 16m - 24m  
 Diagonal lines: more than 24m  
 Dotted pattern: Deteriorated Area  
 Dashed line: Salt Mining Site (potential)

FIGURE 2-3-2 (b)  
 GEOLOGY AND TOPOGRAPHY MAP  
 Scale 1:20,000

ranged ones and, although huts themselves have no problem, the environmental conditions are poor. Residential areas in the center now face serious problems. While the installation of urban roads is extensively under way, the minor streets approaching houses are left as they are. This implies that the installation of urban facilities, such as the sewerage system, is quite difficult. Another problem is the subsidence of the ground and the consequent damage to houses up to complete collapse.

Commercial activities in Jizan are largely concentrated in the northern part of the city. Commercial activities in the central area have two cores: one is around the Municipality office with the suq, and the other is on the road connecting to the seaport. The reason for this separation is not certain, but it may be reasonable to guess that the original market place is the former in relation to the activities of the fishery, and then with the development of the functions of the seaport, the latter emerged.

The seaport facilities have almost gone through the improvement stage and the construction of Cornice Street which may help the activities of the seaport has been completed.

Some redevelopment of residential and commercial areas is now under way. However, the poor soil conditions of the city impose a serious constraint on its implementation. Indeed, because of the poor soil conditions, the city has reached the stage where there is no available land for its further spatial development in the close vicinity of the existing built-up area. The installation and improvement of urban facilities which inevitably support the activities in the city has become quite difficult due to the city's serious natural conditions. Thus partial relocation of the city's activities, as well as development of the currently vacant land south of Old Najran, are important issues in future land use of the city.

#### 2-4-3 FUTURE STRUCTURE

When the proposed relocation program is completed there will be a functional specialization of Existing Jizan, centered around the port and related activities. The structure of land use in Existing Jizan will then be based on outer and inner ring roads. The outer ring road will link the port and other regional activities, while the inner ring road will connect the residential areas that remain in the city. For a further discussion of the future structure of the city, given certain assumptions regarding partial relocation of the city, see Sec. 2-6-2.

#### 2-5 PRINCIPAL ISSUES AND PLANNING OBJECTIVES

The overall philosophy of the planning strategy is for the sub-regions of the Southern Region to develop according to their resources and potentialities. The general categories of planning issues can be classified as follows: Economic Development, Human Resources Development, and Social Development. For the Tihama sub-region, after consideration of both the national development goals and sub-regional resources, the following planning objectives are developed.

- A. Economic Development
  1. Develop the full agricultural potential of the region through government initiated programs for water management and improvement of agricultural productivity.
  2. Develop the full potential for fishery and marine production in the Red Sea through a coordinated public effort to increase the demand for aquatic products and to increase the catch through improved operations.
  3. Develop the full commercial and transport potential of the Jizan port and establish a major gateway to the Southern Region and Kingdom.
  4. Promote the development of a broad range of industrial activities based on the substantial economic, location, and human resources of the sub-region.
- B. Human Resources Development
  1. Increase the productivity and earning capacity of individual workers.
  2. Establish a coordinated program for the assimilation of Yemeni and other foreign workers into the labor force of the Kingdom.
  3. Establish a special program for the education, settlement, and assimilation of nomads.
- C. Social Development
  1. Improve the quality and extent of social welfare services to the residents of the sub-region.
  2. Provide suitable housing for those with limited income.
  3. Create a clean, safe, and healthy environment for the residents of the sub-region and the city of Jizan.

These planning objectives are applicable to the development of the Combined Jizan metropolitan areas as well as to that of the Tihama sub-region as a whole. Development objectives for Existing Jizan, however, must be formulated within the context of a partial relocation of its urban activities. More than other major cities of the Southern Region, Jizan's special endowments and geological and topographical constraints establish

FIGURE 2-11  
MAJOR GOVERNMENT  
LAND  
Scale 1:20,000

governmental property

THE RED SEA



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a unique framework for the development of the city. Thus, of the sub-regional and metropolitan development objectives listed above, objectives A.2, A.3, B.1, and C.3 are particularly pertinent to Existing Jizan.

At the same time, the Master Plan should help formulate the following issues related to relocation:

1. What activities should be relocated.
2. How such a relocation may be accomplished.
3. What are the implications of relocation for Existing Jizan.

These and other issues related to relocation are discussed in Sec. 2-6 below.

## 2-6 RELOCATION OF JIZAN

### 2-6-1 GENERAL

Although Jizan is the only major port in the Southern Region, there are many topographical and geological difficulties associated with the growth of the city. Proposals for relocation have been made, and a preliminary investigation of potential sites for a new Jizan is in progress. Many strategies for relocation have been discussed, but they may be classified into one of three principal alternatives:

1. Overall relocation;
2. Functional division;
3. Rehabilitation;

The first alternative would essentially abandon the existing city of Jizan in favor of a completely new city. Only the port would be maintained. The second alternative would maintain a range of urban activities in Jizan and transfer some functions to a new location in relative proximity to the existing city. The third alternative would maintain all the activities and rehabilitate the city as it exists.

Up through the preparation of the Preliminary Master Plan, the consultants, on instructions of the Deputy Ministry for Town Planning Affairs, refrained from recommending a particular approach to the relocation of Jizan and placed primary emphasis on the planning of the existing city only. There are, however, natural limits to the growth of the city, and it is necessary to forgo some urban functions which cause excessive environmental deterioration or which require comparatively large areas. The Master Plan for the city of Jizan must develop a strategy for the selection of those urban functions which should be retained in the city.

For purposes of this master plan, in the event relocation does take place at a future date, it is assumed that:

1. the port of Jizan will be retained at the present location;
2. a segment of the resident population will remain in Jizan.

Indeed, it is expected that the maintenance of the Jizan port will necessarily result in continued demand for residential land in the existing city. Moreover, since the present growth rate of the city does not reflect its full development potential, the establishment of a new Jizan is likely to increase the migration of rural and nomadic population to the new metropolitan complex.







At the same time, the current discussions on relocation are still at a preliminary stage. Meanwhile, the residents of the city are in serious need of adequate infrastructure and community services. Immediate attention is required to alleviate the existing situation. For these reasons, it is expected that the major policies outlined in this master plan will remain applicable irrespective of particular decisions regarding relocation.

### 2-6-2 CURRENT POLICY FOR RELOCATION

The following information and policies regarding relocation of Jizan have been made available by the Deputy Ministry or assumed from this report:

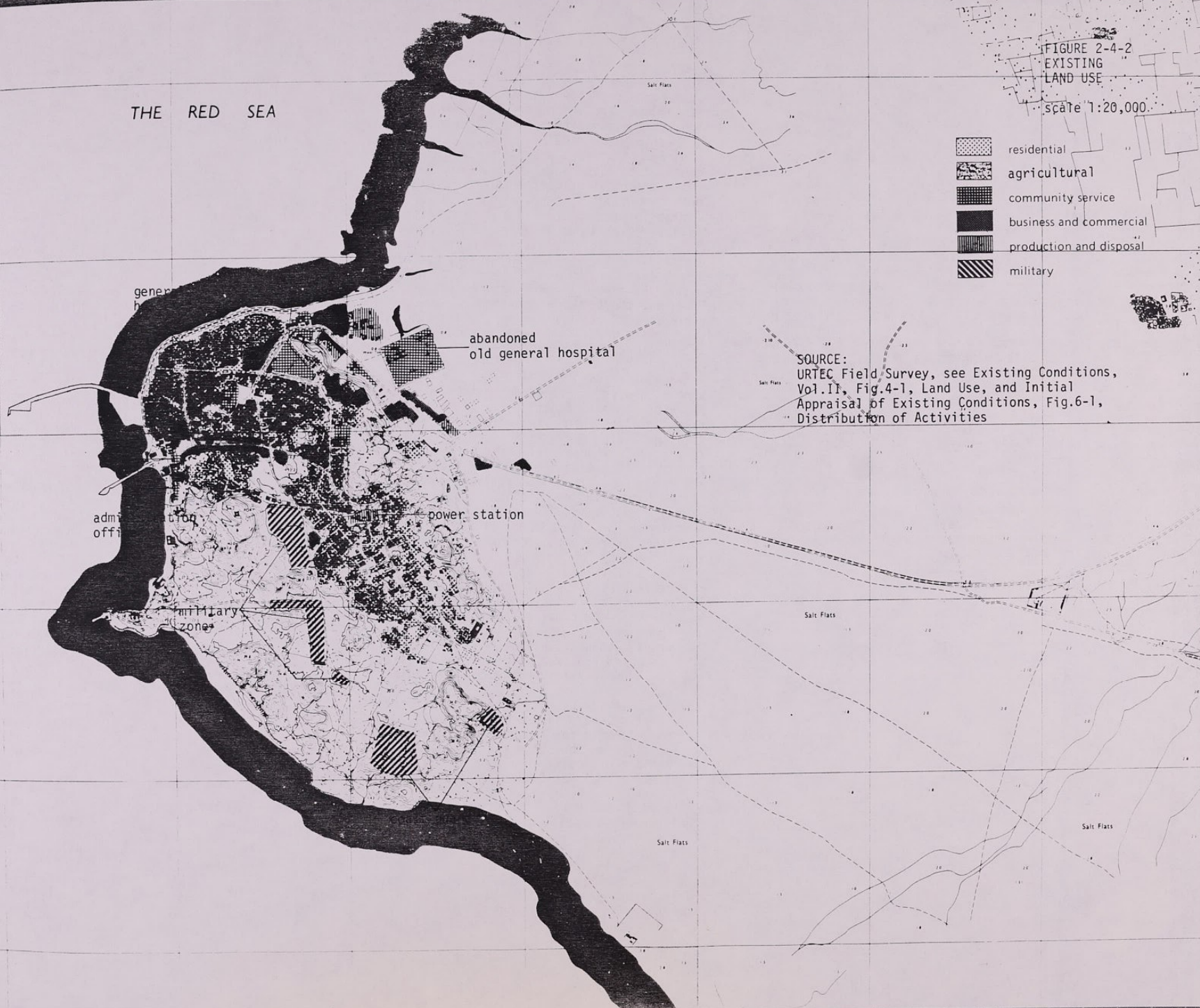
1. After submission of the Preliminary Master Plan, the Deputy Ministry provided the consultant with additional information regarding relocation, namely,
  - a. The location of New Jizan will be 8 to 15 km from Existing Jizan.
  - b. The direction of the location of New Jizan is still under study.
  - c. Relocation will commence in the near future, i.e., within a few years.
2. Through discussions between the Directorate of the Deputy Ministry in the Southern Region, the following planning decisions were made:
  - a. The port and related activities will remain in Existing Jizan and expand in scale of operation.
  - b. Salt mining will be conducted in the center of the promontory, where land has already been reserved by the Ministry of Petroleum and Mineral Resources (Petromin).
  - c. Petromin oil storage area will remain in Existing Jizan and may expand.
  - d. Fishery operations will continue to be based in Existing Jizan. Fishery related industries will be developed in the city.
  - e. Activities related to items 'a' through 'e'

FIGURE 2-4-2  
EXISTING  
LAND USE  
Scale 1:20,000

-  residential
-  agricultural
-  community service
-  business and commercial
-  production and disposal
-  military

SOURCE:  
URTEC Field Survey, see Existing Conditions,  
Vol. II, Fig. 4-1, Land Use, and Initial  
Appraisal of Existing Conditions, Fig. 6-1,  
Distribution of Activities

THE RED SEA



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- will also remain in Existing Jizan.
3. Through further discussions between the Directorate of the Deputy Ministry in the Southern Region and the consultant, the following land use decisions were made:
    - a. A number of workers and their families will continue to live in Existing Jizan even after a partial relocation of the city has been completed.
    - b. A base for marine tourism and recreation will be established in Existing Jizan. It is necessary to allocate land for tourism related facilities such as hotels, beaches, ferry port, and marina.
  4. Based on the forgoing new policy decisions as well as one the comments provided by the Deputy Ministry on the Preliminary Master Plan, the following modifications were made in the city structure and land use for the Final Master Plan:
    - a. Outer ring road.
 

Since there is a greater definition of the share of regional functions to be located in Existing Jizan than was available at the time the Preliminary Master Plan was prepared, it is now possible to give a greater coherence to the organization of such regional functions. This organization is based on the outer ring road, which is an extension and completion of the Cornice Road into a closed loop. The concept of the outer ring road includes the following considerations:

      - (1) Small scale land uses, i.e., residential related uses such as schools and neighborhood facilities, should not be directly accessed from the outer ring road.
      - (2) Truck traffic generated by the port and related industries should be limited to the outer ring road and parking or loading areas directly connected with this road.
      - (3) Although the direction of New Jizan from Existing Jizan is currently unknown, road linking the two may be attached anywhere on the outer ring road, insuring a proper distribution of traffic to the regional facilities of Existing Jizan.
    - b. Inner ring road.
 

The inner ring road will serve small scale land uses such as residential areas located in the interior of the promontory. Connection between the inner and outer ring roads should be limited and controlled. Alignment of the inner ring road should be based on the following considerations:

      - (1) The inner ring road will be composed of

- portions of the existing road network as well as sections of the planned network proposed by the Deputy Ministry.
- (2) Sections of the existing or the planned road networks not included in the inner ring road should be downgraded or de-emphasized, according to the circumstance of each case. Clarifying the road hierarchy can lead to a more well-defined pattern of land use.
  - (3) At present stage of planning, land use along the inner ring road is assumed to be residential and related activities. Although this may change, the basic hierarchical organization of land use will remain a relevant concept.
 

It should be noted that, while some important planning decisions regarding relocation have been made, detailed plans are yet to be considered. Thus, flexibility is an essential factor in planning for Jizan. The concept of concentric ring roads and land use hierarchy is designed to be applicable to a wide range of situations which may arise as a result of relocation.
  - e. Lower population projection
 

At the time the Preliminary Master Plan for Jizan was prepared, the consultant had been instructed by the Deputy Ministry to assume a self-contained city without relocation. Current instructions are to assume that most of the population will in fact reside in New Jizan. A minority of the population will remain in Existing Jizan after relocation. The new instructions are justified in view of the fact that,

    - (1) New Jizan is within commuting distance of Existing Jizan (8 to 15 km is 10 to 20 minutes by bus).
    - (2) Major functions, such as administrative, educational and social services, and agriculture-related industries, will be located in New Jizan.

Thus, the Final Master Plan presented in this report will be based on lower population projections than the Preliminary Master Plan.

#### CHAPTER 2 NOTES:

1. Jizan, Existing Conditions, Vol I, Fig. 3-1-3.
2. Jizan, Existing Conditions, Vol I, Fig. 4-2-1.
3. For a detailed description of these and other housing types, see Jizan, Existing Conditions Vol. I, Sec. 6-1.
4. Ministry of Interior for Municipal Affairs, Soil Investigation for the Town Development of Jizan, Rhein-Ruhr Ing. - GMBH, November 1963.
5. Ministry of Petroleum and Mineral Resources.

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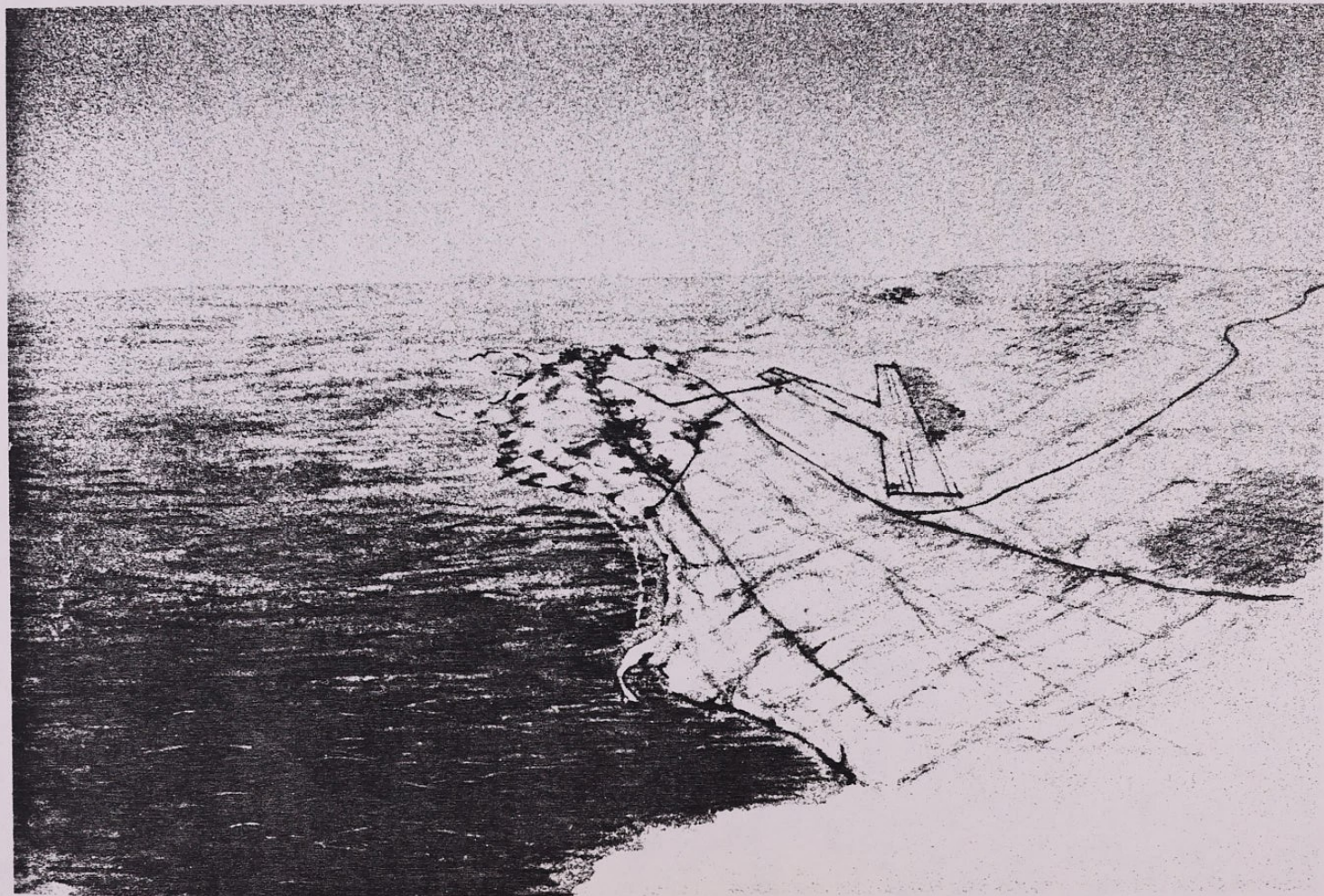
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3. population and housing

3-1 POPULATION PRO-  
JECTION AND  
DISTRIBUTION

3-1-1 EXISTING AND PRO-  
JECTED POPULATION

The population of the city of Jizan as estimated by the URTEC 5% Survey is 22,160 [1]. Of the five cities in the Southern Region, Jizan has the third largest population, behind Khamis Mushayt and Najran.

While cities such as Abha, Najran, and Bishah have low shares of working-age population, Jizan, like Khamis Mushayt, seems to avoid a disproportionate loss of its working-age population. In particular, the share of males from ages 15 to 59 in the total city population is 26.7%, the highest among the five cities.

Saudis comprise 84% of the total population in Jizan and 80% of the total population of the five major cities [2]. Despite access from the sea and air, it appears that Jizan's foreign population percentage is the lowest in the Southern Region. Of the non-Saudi population, however, Yemenis comprise 85%, reflecting Jizan's proximity to Yemen.

The estimated rate of population growth in Jizan is 2.6% per year. This rate is the lowest among the five cities of the Southern Region and substantially below the rate of the next lowest city, Najran, with 4.6% per year.

This low overall rate of growth is due principally to the extremely high out-migration rate of 3.2% per year, compared to 1.3% for the five cities. Although the rate of in-migration is relatively high--3.4% per year for Jizan compared to 2.3% for the five cities--the high out-migration rate reduces the social rate of increase to 0.2% per year.

The URTEC 5% Sample Survey concerning out-migration reveals that job-related reasons account for 27% of cases and schooling accounts for 24% [3]. It may be surmised that the desire for better living conditions is a major factor in the out-flow of population.

Another indicator of population movement is the length of stay at the present address. In Jizan, over 70% of households have spent the last 6 or more years at the present address [4]. In

Table 3-1-1  
PROJECTIONS OF POPULATION

	1975	1980	1985	1995
Combined Jizan <sup>a</sup>				
High <sup>b</sup>	-	26,500	31,600	45,000
Low <sup>b</sup>	-	25,200	28,700	37,100
Planning <sup>c</sup>	22,160 <sup>d</sup>	26,000	30,000	41,000
Existing Jizan <sup>e,h</sup>	22,160	26,000	20,000	8,000 <sup>f</sup>
New Jizan	-	-	10,000	33,000

Notes:

- Combined Jizan is the same as Existing Jizan until the commencement of relocation, assumed to take place between 1980 and 1985. After 1985, Combined Jizan is the sum of Existing and New Jizan, See Sec. 2-1-1 for definitions of these terms.
- High projection is based on an annual growth rate of 3.6% per year and low projection on an annual growth rate of 2.6% per year. See Southern Region, Preliminary and Final Physical Plans, Sec. 9-3, for a detailed discussion of projection methodology.
- Planning projection for 1975 is the current estimated population. Planning projections for 1980 and beyond are the means of high and low projections, rounded to the nearest 1,000.
- The current estimated population is based on the URTEC 5% Sample Socio-Economic Survey conducted by the consultant in 1974-1975. Discrepancy between the figure quoted by the 1974 National Census is discussed in Southern Region, Preliminary Physical Plan, Sec. 9-1-2.
- It is assumed that sufficient infrastructure and housing of New Jizan will have been constructed by 1985 to enable relocation of approximately one-third of the projected population of Combined Jizan.
- This is the approximate target population for Existing Jizan, given a larger New Jizan within commuting distance.
- New Jizan is assumed to be established within 8 to 15 km of Existing Jizan, beginning sometime between 1980 and 1985.
- Due to the tentative and uncertain nature of assumptions made for these areas, 'high' and 'low' projections cannot be interpreted in the same manner as in the Master Plans of other major cities of the Southern Region. Thus only the planning projections were retained.

FIGURE 3-1-0  
 PLANNING  
 BOUNDARY AND  
 SOCIO-ECONOMIC  
 SURVEY AREA  
 scale 1:20,000




THE RED SEA

1995

45,000  
 37,100  
 41,000

8,000f

33,000

-  planning area boundary
-  URTEC 5% sample, Socio-Economic Survey, principal survey area, and area number
-  URTEC 5% sample Socio-Economic survey districts, and district number

SOURCE:  
 Existing Conditions, Vol.I, Fig.3-1-3.  
 See Existing Conditions, Vol.I Fig.3-1-4,  
 for population density by survey district.  
 For change in population density by district,  
 see Existing Conditions, Vol.II, Fig.3-1



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comparison, only 45% of households in Khamis Mushayt have spent the same amount of time at the present address. Thus, in spite of the high rates of movement, the major portion of the population in Jizan is relatively stable. It may be inferred that many people who in-migrate to Jizan will very likely out-migrate. Jizan seems to be an intermediate stop in the overall movement of the population to other cities of the Kingdom.

Based on the annual growth rate of population of 2.6% and an exponential model, the trend projection of population in 1995 is 37,100. However, if the living conditions in Jizan are improved and new residential areas provided, the population growth rate may be increased by one percentage point above the existing rate. Based on this accelerated growth rate of 3.6% per year, the projected population of Jizan in 1995 will be 45,000.

The projected populations of Combined Jizan are summarized in Table 3-1-1. The two projections indicate a range of estimated projections for planning analysis. While both projections should be considered in the estimations of demand for land, the average of the two figures, 41,000, may be used as a general index of population in 1995.

For purposes of this plan, it is assumed that sufficient infrastructure and housing will have been built in New Jizan by 1985 to absorb approximately one-third of the projected population in that year. The fact that this is an assumption, rather than a projection, cannot overemphasized. The distribution of population between Existing and New Jizan must be critically re-examined in light of construction in New Jizan.

### 3-1-2 COMMUNITY STRUCTURE

The community structure is divided into a number of hierarchial sub-groupings. Each of these sub-groupings is expected to house an estimated population and provide a certain range of services. These groupings are given as follows:

Table 3-1-2  
SUBGROUPS OF COMMUNITY HIERARCHY

GROUPING LEVEL	NAME OF GROUPING	TYPICAL POPULATION
G <sub>0</sub> (Level 0)	Residential Unit Group	250
G <sub>1</sub> (Level 1)	Sub-Neighborhood	937 (say, 1,000)
G <sub>2</sub> (Level 2)	Neighborhood	3,750 (2,500 to 5,000)
G <sub>3</sub> (Level 3)	Sub-Community	15,000 (10,000 to 20,000)
G <sub>4</sub> (Level 4)	Community	30,000 (20,000 to 40,000)

For purposes of the Master Plan, Existing Jizan has been divided into planning districts as indicated in Fig. 3-1-3. Of these districts, the residential areas have been grouped and identified to facilitate further discussions:

1. Southwestern development area (planning district 1.1).
2. Eastern development area (planning district 1.2).

The northern area (planning district 2.1), the southeastern area (planning district 2.7), and the southern off-promontory area (planning district 2.8) are reserved for industrial and warehousing uses. The central area (planning district 2.2) is reserved for future salt mining activities.

The breakdown of the community structure into a number of subgroupings also calls for the provision of certain services by each of the subgroupings. Specifically, each neighborhood should provide an elementary school, and each sub-community an intermediate school.

### 3-1-3 POPULATION DISTRIBUTION BY NEIGHBORHOODS

Currently, the population of Jizan is distributed principally in Old Jizan (planning district 2.1), in the central and eastern areas (planning districts 2.2 and 1.2), and in the northern portion of planning district 1.1. Over the twenty-year planning, it is recommended that planning areas 2.1 and 2.2 be completely evacuated. The first area, as discussed in Sec. 3-3-2, suffers from largescale functional obsolescence and insanitary conditions; the second area has been reserved for salt mining by the Ministry of Petroleum and Mineral Resources. In the project target year of 1995, there will be 8,000 residents in Jizan, grouped in two neighborhoods of 1.1 and 1.2. The two neighborhoods comprise a sub-community, but

CAL POPULATION

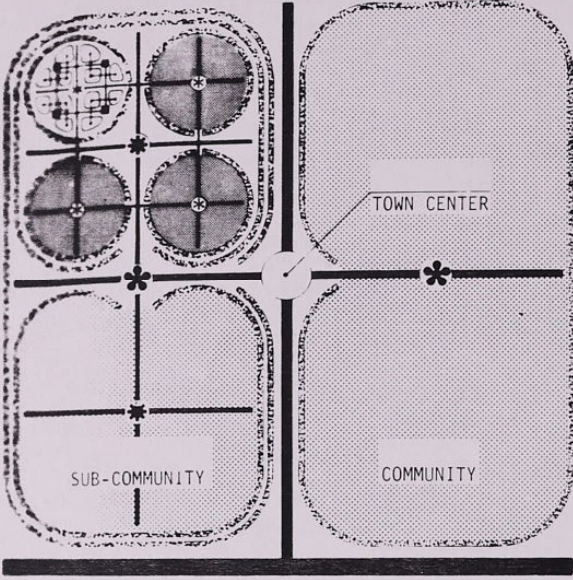
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- inter regional and regional highway
- major arterial
- minor arterial
- collector
- distributor
- local access road
- residential unit group center
- sub-neighborhood center
- neighborhood center
- sub-community center
- community center
- residential unit group
- neighborhood
- buffer zone

FIGURE 3-1-2  
COMMUNITY  
STRUCTURE  
DIAGRAM

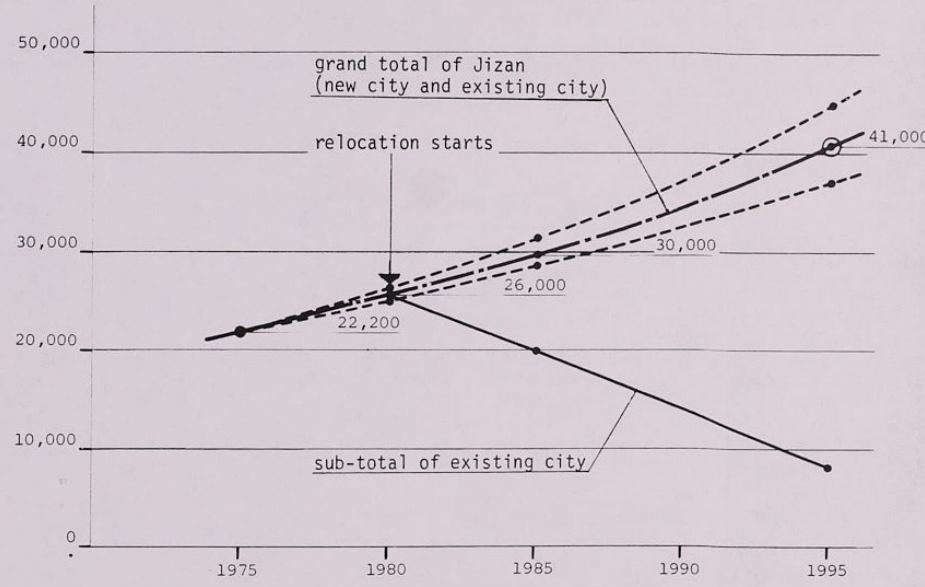


FIGURE 3-1-1  
PROJECTED  
GROWTH OF  
POPULATION





the total population is not large enough to form a full community, as defined in Table 3-1-2. Nevertheless, since Existing Jizan will be separated from the New Jizan by 8 to 15 km, it is proposed that some community-level facilities, in particular the secondary schools for boys and girls, be provided in Existing Jizan.

Table 3-1-3  
COMMUNITY STRUCTURE &  
FACILITIES DISTRIBUTION

Community Level	Education Facilities	Recreation facilities	Religious facilities	Social/cultural facilities	Health facilities	Commercial facilities	Public buildings
Residential unit group	Tot-lot	Residential seating					
Sub neighborhood	Nursery Kindergarten	Play lot					
Neighborhood	Elementary schools	School playground, Neighborhood park	Mosque	Neighborhood center	Pharmacy	Neighborhood shopping center	
Subcommunity	intermediate schools	Playfield (Level 1)	Jami'a mosque		Diagnosis & treatment center		
Community	Secondary schools	Playfield (Level 2), Community park		Community center		Community shopping center	Fire station
City	Teachers schools Technical schools	City park		Civic center	General hospitals, Special hospitals, Nursing homes	City/Regional shopping center	Post office, Police station, Government
Sub-region and Region	College/university, special college		Eid mosque				Government

FIGURE 3-1-3  
1995 PROPOSED  
COMMUNITY  
STRUCTURE

scale 1:20,000

-  neighborhood
-  sub-community
-  community
-  planning districts
- 1.1 neighborhood-number

THE RED SEA



Commercial facilities

Public buildings

Neighborhood shopping center

Community shopping center

Fire station

City/Regional shopping center

Post office, Police station, Government

Government

Table 3-1-4  
PROJECTED POPULATION AND HOUSING NEEDS BY DISTRICT  
EXISTING JIZAN

Planning District	1975		1980		1985		1995	
	Popula- tion <sup>a</sup>	Hous- ing U. <sup>b</sup>	Popula- tion	Hous- ing U.	Popula- tion	Hous- ing U.	Popula- tion	Hous- ing U.
1.1	1,940	298	2,270	391	3,100	596	4,200	875
1.2	6,680	1,027	9,610	1,657	7,800	1,500	3,800	792
2.1	7,950	1,223	8,030	1,384	5,500	1,058	-	-
2.2	4,450	684	5,200	897	3,600	692	-	-
2.3	350	54	310	54	-	-	-	-
2.4	-	-	-	-	-	-	-	-
2.5	50	8	-	-	-	-	-	-
2.6	10	2	-	-	-	-	-	-
2.7	-	-	-	-	-	-	-	-
2.8	-	-	-	-	-	-	-	-
3.1	30	5	-	-	-	-	-	-
3.2	-	-	-	-	-	-	-	-
3.3	-	-	-	-	-	-	-	-
4.1	650	100	580	100	-	-	-	-
- <sup>c</sup>	50	8	-	-	-	-	-	-
Existing Jizan	22,160	3,409	26,000	4,483	20,000	3,846	8,000	1,667
New Jizan					10,000	1,923	33,000	6,875
Combined Jizan	22,160	3,409	26,000	4,483	30,000	5,769	41,000	8,542
Household Size	650		5.80		5.20		4.80	

Notes:

- a. Existed population estimated from URTEC 5% Survey. See Jizan, Existing Conditions, Vol I, Table 3-1-13, adjusted for changes in boundaries from survey to planning districts.
- b. Population divided by household size. For household size, see text and Table 3-2-1.
- c. Outside the designated neighborhoods but contained in the planning area.



3-2 HOUSING NEEDS

The total number of housing units required in the future can be derived by the projected population and the size of the household. The average size of the household in Jizan is known from the URTEC 5% Sample Survey to be 6.50 persons. This size is expected to decline rapidly as the general income level rises and as housing becomes more available. It is assumed that the average size of households would decline to 5.20 persons/household in 1985 and 4.80 persons/household in 1995. The total stock of housing units needed during the planning period is thus calculated in Table 3-2-1.

Required housing construction can be derived by subtracting the stock in 1975 and adding the number of obsolete houses and houses destroyed for development.

Due to lack of land, present housing is intermixed with other land uses. In order to protect the living environment of the residents, however, housing should be separated from industrial and large-scale commercial activities. At the same time, most housing in the coastal flat area is in an insanitary area without adequate sewerage or drainage; structurally damaged houses in the mid-section of the old city create safety hazards for the surrounding residents. In the central area, where houses have been constructed on the salt mine reserve, residents must be relocated to other areas in order to make mining operations possible.

It is therefore recommended that the existing housing areas be gradually converted to other uses over the planning period and that new housing areas be provided in the former military zone located in the southwestern part of the city.

Table 3-2-1  
PROJECTED HOUSING NEEDS

	1975	1980	1985	1995
Household Size <sup>a</sup>	6.50 <sup>b</sup>	5.80	5.20	4.80
Combined Jizan Population				
High	-	26,500	31,600	45,000
Low	-	25,200	28,700	37,100
Planning	22,160	26,000	30,000	41,000
Housing Needs <sup>c</sup>				
High	-	4,550	6,040	9,250
Low	-	4,340	5,520	7,730
Planning	3,420	4,480	5,770	8,540
Existing Jizan Population	22,160	26,000	20,000	8,000
Housing Needs <sup>c</sup>	3,420	4,480	3,850	1,670

Notes:

- a. Household size is assumed to decrease with increasing income and increasing availability of housing.
- b. Estimated from URTEC 5% Survey. See Jizan, Existing Conditions, Sec. 3-1.
- c. Population divided by household size.

### 3-3 HOUSING POLICY

#### 3-3-1 EXISTING HOUSING

The URTEC Survey identified six housing types in Jizan, including the indigenous hut shelter and the recently introduced concrete housing similar to those observed in other areas of the Southern Region [5]. The traditional houses generally exhibit very effective use of courtyards and other enclosed outdoor spaces. High density of housing is made possible by the use of these outdoor spaces as extensions of the interior spaces.

In Jizan, there are currently 22,200 people in 3,420 units of housing [6], distributed over 87 ha of residential neighborhood area [7]. For planning purposes, residential neighborhood area is the sum of net residential area, residential access roads, elementary level schools, recreational areas, neighborhood mosques and neighborhood shopping. The existing average residential density, therefore, is 255 persons per hectare (pph), or 39 dwelling units per hectare (d.u./ha).

The most prevalent housing type in Jizan is the traditional hut shelter within a courtyard arrangement [8]. Such a type can be found in virtually every quarter of the city. The simple hut shelter located within a fenced lot [9], a more primitive form of housing, has reappeared in the residential areas in the central valley.

In the northern section, housing is intermixed with commercial and governmental activities. Density is extremely high in this area. Gross residential density is over 500 pph immediately west and north of the cemetery [10]. Such extreme congestion makes it impossible to achieve either proper housing standards or efficient functioning of commercial and public service activities.

#### 3-3-2 OBSOLESCENT HOUSING AND POLICIES FOR IMPROVEMENT

The causes of physical obsolescence of housing in Jizan are aging and structural damage from subsidence. Functional obsolescence is due mainly to lack of adequate drainage and sewerage systems.

Structurally damaged houses due to subsidence or uneven settlement are found in areas extending from the town square to a block south of the cemetery. Such areas roughly correspond to a zone of uneven subsurface strata with potentially weaker geological characteristics. The immediate causes of subsidence, however, are (1) increased dead loads of modern concrete buildings and (2) de-

creased bearing capacity of the soil due to sewage contamination or leakage from water pipes. In order to avoid future soil problems, it is recommended that the government create detailed regulations and guidelines concerning foundation and construction standards. Sewerage and drainage networks should be installed, and surface discharges of sewage should be prohibited.

The insanitary conditions in Jizan are due to: (1) lack of proper disposal of sewage and (2) lack of adequate stormwater drainage. There is no sewerage network in the city. Cesspools exist for certain large establishments, but residential areas depend solely on the absorptive capacity of the soil. Over 100 ha of land, encompassing most of the present urban area, is considered to be insanitary.

There are no stormwater drains in Jizan. The city depends on natural drainage through naturally occurring water courses. As a result, the very flat areas in the old section of the town are periodically flooded, with storm water remaining in depressions up to several months [11]. This aggravates the sewage problem and creates substandard living conditions.

In areas of higher residential density along the northern coast, the incidence of disease has increased. As housing is made available in the southern areas, residents of the northern coastal area should be transferred and houses demolished.

The critical element in the provision of future housing is the nature and extent of the role of the government. Among the numerous alternative policies, three approaches are applicable to Jizan:

- A. Direct government construction of housing
- B. Enforcement of strict building and housing codes accompanied by government assistance and subsidies for improvement.
- C. Direct government construction of high-density housing and private construction of medium to low-density-housing.

Direct government construction of housing should be considered in order to provide high-density housing which is structurally sound and which has adequate amenities. The housing units to be constructed should be aimed at middle and low income classes. The sales or rental prices should be adjusted to occupants with a wide range of economic standards.

of the soil due to sewage from water pipes. If soil problems, it is recommended that the government create detailed studies concerning foundations, sewerage and drainage systems, and surface disposal. Sewerage and drainage are prohibited.

in Jizan are due to: (1) of sewage and (2) poor drainage. There is no water supply. Cesspools exist for the town, but residential areas are built on land of low absorptive capacity of the soil, encompassing most of the town. This is considered to be in-adequate.

in Jizan. The city is built on a hillside through naturally occurring water. As a result, the very flat areas of the town are periodically flooded. Water remaining in depressions creates substandard housing conditions [11]. This aggravates the health problem and creates substandard housing conditions.

High population density along the coast has led to the spread of disease. The lack of available land in the town has led to the demolition of houses and the construction of new houses.

The provision of future housing should take into account the role of the government and the numerous alternative housing solutions applicable to the situation.

The construction of housing should take into account the building and housing program and government assistance in the housing program.

The construction of high-density housing should take into account the construction of housing.

The construction of housing should take into account the construction of high-density housing, the construction of sound and which housing units to be constructed, the construction of middle and low density housing, the construction of rental prices, and the construction of housing units with a wide range of housing units.

THE RED SEA



FIGURE 3-3-1  
EXISTING  
RESIDENTIAL  
AREAS

scale 1:20,000

- residential area
- steep hill
- defense zone boundary
- salt flat

SOURCE:  
URTEC Field Survey, see Existing Conditions, Vol. II, Fig. 4-1, Land Use, and Initial Appraisal of Existing Conditions, Fig. 6-1, Distribution of Activities

The second alternative would rely exclusively on the private sector to provide housing in Jizan. However, standards for foundation, structural design, and mechanical equipment would be strictly controlled by the government in order to insure the health and safety of the inhabitants. Loans and subsidies should be provided when the individual owner is unable to meet the standards through a reasonable outlay of his capital. Although this alternative would maintain a high degree of individual initiative, housing would be provided at a slower speed and with less organization than the first alternative.

The third alternative combines elements of the first and second alternatives. Direct government construction will be in selected areas of the city, particularly where there are complex structural and public utility requirements. The remaining residential areas would be closely regulated, with assistance and subsidies as necessary.

### 3-3-3 RESIDENTIAL DENSITY POLICY

The backbone of the urban development plan for the city of Jizan is to relocate the residential area from the northern coastal area to the undeveloped southern area as well as to New Jizan, whose detailed location or plan are not yet known at present. However, the southern area also possesses problems as a residential development site. The poor conditions of the soil coupled with a pre-ordained limited endowment of land makes impossible the attainment of a dense residential development in Jizan. Therefore, the best that can be hoped for is that Jizan's population is distributed mainly at relocated New Jizan and in parts of Existing Jizan.

## 3-4 HOUSING LAND USE

### 3-4-1 SOIL CONDITIONS AND HOUSING TYPE

Geological characteristics of Jizan have been described in Sec 2-3-3. There is little bearing capacity of soil in all parts of the promontory, and special site preparation will be required for any new construction. It is therefore recommended that only low density housing of standard to small villas be constructed in Existing Jizan. The net residential density of standard to small villas is approximately 150 persons per hectare [12]. With the addition of street, elementary schools, and other neighborhood facilities, the net neighborhood density is 90 persons per hectare or less. For the Master Plan, average gross neighborhood density of approximately 60 persons

per hectare is assumed to prevail on the 140 hectares of land which may be devoted to residential use, resulting in recommended target population for Existing Jizan of approximately 8,000 inhabitants [13]. The predominant housing type was multi-family low and mid-rises, constructed on grade beams and piles.

### 3-4-2 PHASED RESIDENTIAL LAND REQUIREMENTS

Between 1975 and 1995, population in Old Jizan will be relocated to southwestern and eastern areas (planning districts 1.1 and 1.2) and to New Jizan. There will be a decrease in the overall population of Existing Jizan, as indicated in Table 3-1-4, as well as a decrease in the residential neighborhood density. The planned target population of Existing Jizan in 1995 will be 8,000 inhabitants on 140 ha of residential neighborhood area, resulting in residential neighborhood density of roughly 60 persons per hectare.

For a summary of required new housing construction over the planning period, see Table 3-4-1.

Table 3-4-1  
REQUIRED NEW HOUSING CONSTRUCTION, EXISTING JIZAN

	Phase I 1975 - 1980	Phase II 1980 - 1985	Phase III 1985 - 1995
Required Net Change in Housing Needs <sup>a</sup>	1,074	(637)	(2,179)
Obsolescent Housing to be replaced <sup>b</sup>	23	842	2,458
Required New Housing Construction <sup>c</sup>	1,097	205	279

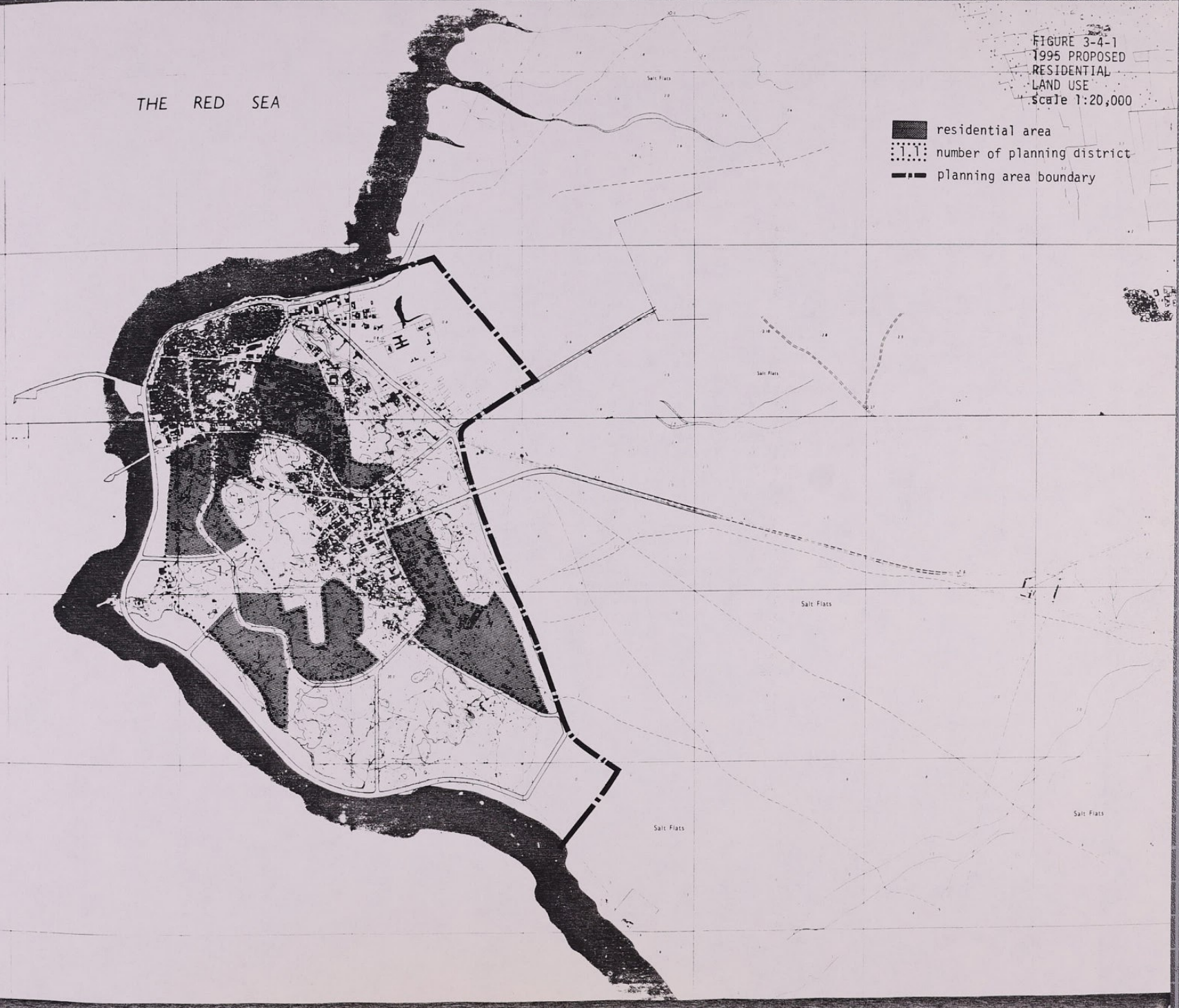
#### Notes:

- Difference in total housing needs between the beginning and the end of a phase. See Table 3-1-4. For example, for Phase I (1975 - 1980), 4,483 - 3,409 = 1,074. Figures in parentheses indicate that there will be a net decrease in the total housing needs, due to relocation of population to New Jizan.
- Number of existing housing units which must be replaced due to physical or functional obsolescence. Most existing housing suffer from insanitary conditions, and a majority of the remaining houses occupy the salt mine reserve. See Jizan, Initial Appraisal of Existing Conditions, Fig. 6-3-3. For a schedule of relocation, see Table 3-1-4 in the present report.
- Sum of Net Change in Housing Needs and Obsolescent Housing.

FIGURE 3-4-1  
1995 PROPOSED  
RESIDENTIAL  
LAND USE  
Scale 1:20,000

■ residential area  
 □ number of planning district  
 - - - planning area boundary

THE RED SEA



prevail on the 140 hect-  
 devoted to residential  
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ING JIZAN

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	279

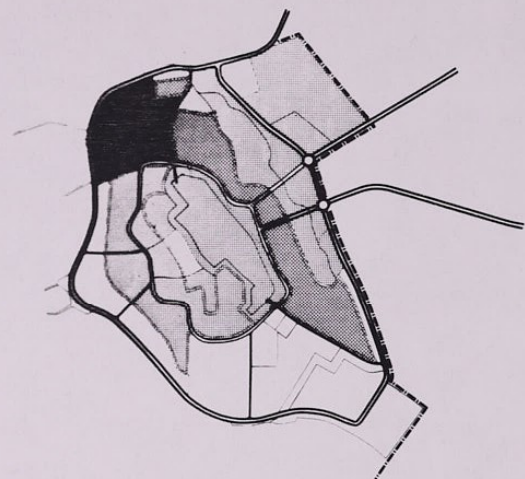
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 tions, Fig. 6-3-3.  
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CHAPTER 3 NOTES

1. Kenzo Tange & URTEC, Southern Region Project Study, Jizan, Existing Conditions, Vol. I, Sec. 3-1.
2. From URTEC 5% Sample Survey, see Jizan, Existing Conditions, Vol. I, Sec. 3-1.
3. Jizan, Existing Conditions, Vol. I, Sec. 3-1.
4. Jizan, Existing Conditions, Vol. I, Sec. 3-1.
5. Kenzo Tange & URTEC, Southern Region Project Study, Jizan, Existing Conditions, Vol. I, Sec. 6-1.
6. From URTEC 5% Sample Survey. See Jizan, Existing Conditions, Vol. I, Sec. 3-1.
7. Sum of residential, educational, religious, and recreational land use areas. From Jizan, Existing Conditions, Vol. I, Table 4-2-1.
8. Housing types AC and AC'. See Jizan, Existing Conditions, Vol. I, Sec. 6-1.
9. Housing type A. See Jizan, Existing Conditions, Vol. I, Sec. 6-1.
10. Population survey enumerating district No. I-1; land use enumeration block Nos. 2, 3 and 30. See Jizan, Existing Conditions, Vol. I, Fig. 3-1-3 and 4-2-1.
11. Flooding is a serious problem near the open-air markets west of the large cemetery.
12. See Appendix, Planning Standards, Fig. A-2-8/
13. It should be noted that it is possible to build higher density housing, if a greater investment is devoted to soil preparation and foundation construction. In the Preliminary Master Plan, formulated under an assumption of a self-contained Jizan without relocation, as instructed by the Department of Town Planning, the predominant housing type was multi-family low and mid-rises, constructed on grade beams and piles.

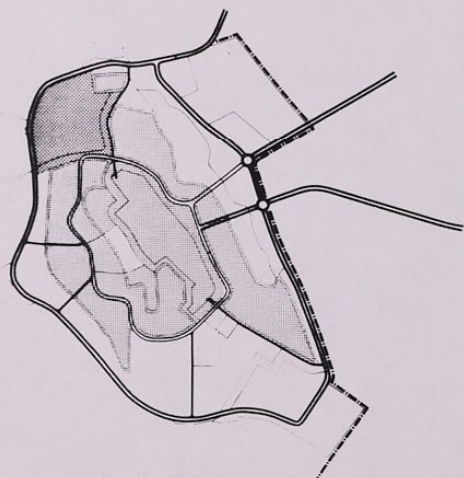
FIGURE 3-4-2  
GROWTH OF  
RESIDENTIAL  
AREA  
1975 - 1995  
scale 1:40,000



1975



1980



1985



1995

low density \*1  
medium density \*2  
high density \*3

\*1 less than 80 ppha  
\*2 80-130 ppha  
\*3 over 130 ppha  
See Table 3-1-4, Projected  
Population and Housing Needs  
by District.





4. employment

#### 4-1 SECTORAL COMPOSITION AND PROJECTION

##### 4-1-1 EXISTING CONDITIONS

Out of a population of 22,160 in Jizan, 19.8% or 4,400 people, are gainfully employed [1]. The participation rate is basically the same as the average rate of 19.5% for all the five major cities in the Southern Region.

The sectoral distribution of workers has been estimated in Table 4-1-1. In the table, primary sector denotes agriculture, mining, and fishing, secondary sector denotes manufacturing and construction, and tertiary denotes trade, finance and insurance, and real estate. The relatively large number of workers engaged in fishing is a natural consequence of Jizan's fishery potential. The proportion of workers engaged in construction, however, is less than one-third of the five-city average. Even though Jizan has a relatively large population, there appears to be little new construction in the city. The lack of land is probably the primary cause of the small construction sector.

The share of workers in trade is one-third higher than the five-city average. This is largely due to the existence of a port in Jizan. The share of government employees is approximately equal to the five-city average. It is hoped that as the city develops, this percentage will decrease.

##### 4-1-2 PROJECTED EMPLOYMENT

Employment projections for Combined Jizan are derived by applying the estimated rates of labor force participation to the projected population. Similar to other cities in the region, the participation rate is expected to increase gradually over time. The labor force participation rate is expected to rise for 2 reasons:

1. an increase in the number of women entering the labor force; and
2. a rise in the level of life expectancy.

Based on the above, the labor force participation rate of 19.8% in 1975 is assumed to increase by 2 percentage points every five years so that by 1995 it reaches 27.8%. Employment projections for the years 1980, 1985, and 1995 are given in Table 4-1-1(a).

Analysing the distribution of employment by sectors, the percentage of employment in the fishing and manufacturing sectors is expected to increase. The demand for new construction will cause employment to rise in that sector. The anticipated

trend is that the government sector will diminish in importance while the private sector will grow.

For employment projections in Existing Jizan, the following assumptions have been made:

1. The initial phase of relocation will be concentrated in residential developments of New Jizan. Relocation of employment will lag behind that of population. For planning purposes, employment in Existing Jizan is assumed to be 90% of total employment in Combined Jizan in 1985. It is expected that after 1985, the share of employment located in Existing Jizan will steadily decline.
2. The number of workers who both live and work in Jizan will be the assumed population of Existing Jizan times the labor force participation rate, i.e., 4,800 in 1985 and 2,200 in 1995. The remaining workers in those years will live in New Jizan and work in Existing Jizan. Thus the expected numbers of commuters between the New and Existing Jizan are 1,600 in 1985 and 4,600 in 1995.
3. All the increases in the primary sector workers, i.e., those engaged in fishing, (salt) mining, and related activities, are assumed to be employed in Existing Jizan.
4. Workers in the secondary, tertiary, and government sectors in Existing Jizan are assumed to be distributed at the same proportion as the workers in the equivalent sectors in Combined Jizan.
5. Government workers will be the first to be relocated to New Jizan. It is expected that there will be an absolute decline in the number of government workers employed in Existing Jizan by 1995.

Projections of employment in Existing Jizan based on forgoing assumptions are tabulated in Table 4-4-1. (b).

##### 4-1-3 EMPLOYMENT NEEDS

Jizan is first and foremost a port city, and with the first phase of the port's expansion recently completed and with further expansion currently being considered, there is an expectation that activity related to the port will increase significantly in the near future. This will create a definite need for manpower to staff the port facility.

On the other hand, since Jizan's possibilities for growth in areas not related to the port are limited, and since the city anticipates a substantial increase in its labor force in the near future, it must monitor carefully the number of foreign workers entering the city. Perhaps, the government should develop a policy which would divert

Table 4-1-1(a)  
PROJECTIONS OF EMPLOYMENT

	1975 <sup>a</sup>	1980	1985	Old City 1985	1995	Old City 1995
Planning Population	22,160	26,000	30,000	20,000	41,000	8,000
Labour Force Participation Rate (%)	19.8	21.8	23.8	23.8	27.8	27.8
Total Employment	4,380	5,700	7,100	4,760	11,400	2,224
Primary <sup>b</sup>	380 ( 8.7) <sup>e</sup>	580 (10.2)	840 (11.8)	840	1,360 (11.9)	1,360
Secondary <sup>c</sup>	220 ( 5.0)	570 (10.0)	930 (13.1)	582	1,960 (17.2)	169
Tertiary <sup>d</sup>	1,380 (31.5)	1,950 (34.2)	2,330 (32.8)	1,459	3,980 (34.9)	342
Government	2,120 (48.4)	2,600 (45.6)	3,000 (42.3)	1,879	4,100 (36.0)	353
Other	280 ( 6.4)	0	0	0	0	0

Notes:

- From URTEC 5% Sample Survey of Population.
- Primary includes fishing and mining.
- Secondary includes construction and manufacturing.
- Tertiary includes commercial and private service factors.
- Figure in parentheses are percents.

Table 4-1-1 (b)  
PROJECTIONS OF EMPLOYMENT EXISTING JIZAN

	1975 <sup>a</sup>	1980 <sup>a</sup>	1985	1995
Total Employment	4,380	5,700	6,400	6,800
Primary <sup>c</sup>	380 ( 8.7) <sup>d</sup>	580 (10.2)	840 (13.1)	1,360 (20.0)
Secondary <sup>e</sup>	220 ( 5.0)	570 (10.0)	830 (13.0)	1,060 (15.6)
Tertiary <sup>e,f</sup>	1,380 (31.5)	1,950 (34.2)	2,171 (32.3)	2,160 (31.8)
Government <sup>e</sup>	2,120 (48.4)	2,600 (45.6)	2,660 (41.6)	2,220 (32.6)
Other <sup>g</sup>	280 ( 6.4)	-	-	-

Table 4-1-1 (b) Notes:

- Same as Combined Jizan for 1975 and 1980. Relocation to New Jizan is assumed to commence sometime between 1980 and 1985.
- Total Employment in Existing Jizan is assumed to be 90% of total employment in Combined Jizan in 1985 and 60% of total employment in Combined Jizan in 1995, resulting in 1,600 commuters from New to Existing Jizan in 1985 and 4,600 commuters in 1995.
- All primary sector workers and their families are assumed to remain in Existing Jizan, even after partial relocation is completed.
- Figure in parentheses indicate the percent sectoral share of workers.
- Existing Jizan's workers in secondary, tertiary, and government sectors are assumed to be distributed in the same proportions as workers in the equivalent sectors in Combined Jizan.
- Includes all commercial, transport, and service sectors, exclusive of government.
- All workers after 1980 are assumed to be classified in one of the four major sectors.

excess foreign workers to other areas of the Kingdom which have a definite need for labor.

#### 4-2 DISTRIBUTION OF EMPLOYMENT CENTERS

Employment within the government sector will still be important in the future but the manufacturing and distributive activities will gain momentum. Therefore, the two key sectors in determining the location of employment centers are the location of Government offices and the location of the port.

At the present time, most of the Government offices are located in the central area of the city east of the port. However, this location is undesirable for two reasons:

1. poor soil conditions; and
2. inconvenience for newly developing areas located in the south.

The location of the port is firmly established, and as mentioned earlier, future expansions will be made on the basis of the existing port. As a result, the port-related activities should be planned to be adjacent to the existing port. It is planned that a significant volume of employment will be maintained in this area, which will accommodate light to heavy industries and warehousing activities. Specifically, planning district 2.1 has been set aside for this purpose. Because of its proximity to most activities, this area will be able to accommodate mostly all forthcoming industries. The heavier industries should be located closer to the water, and service orientated ones such as automotive repairing closer to Route 54.

#### 4-3 INCOME DISTRIBUTION

##### 4-3-1 EXISTING CONDITIONS

For purposes of analysis, the city of Jizan can be divided into three districts:

1. High Income District--a district where the share of households with income of S.R. 2,001 or more per month exceeds 15%.
2. Medium Income District--a district characterized as neither a high nor a low income district.
3. Low Income District--a district where the share of households with income of S.R. 500 or less per month exceeds 55%.

Using this scheme, the following general characterizations can be made:

1. the northern coastal area is a high income district

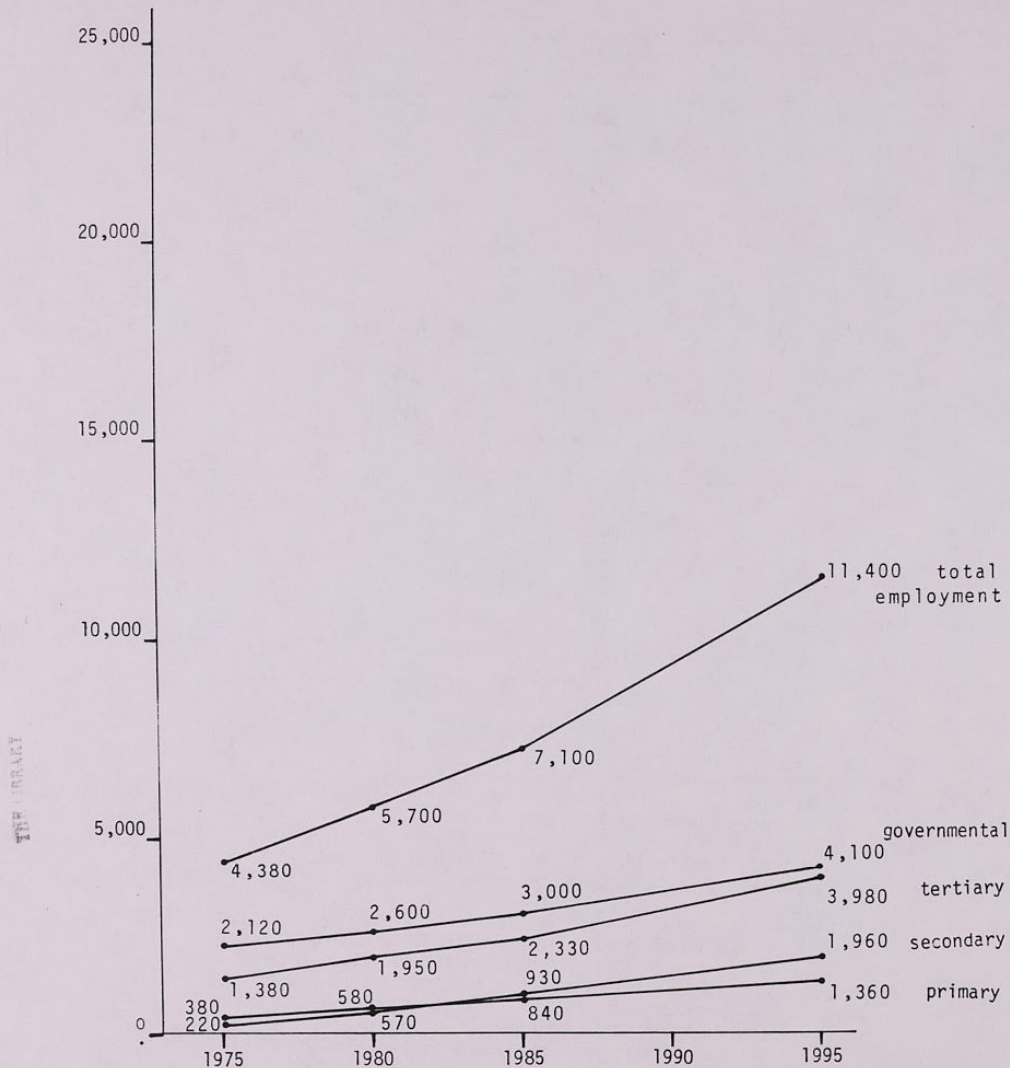


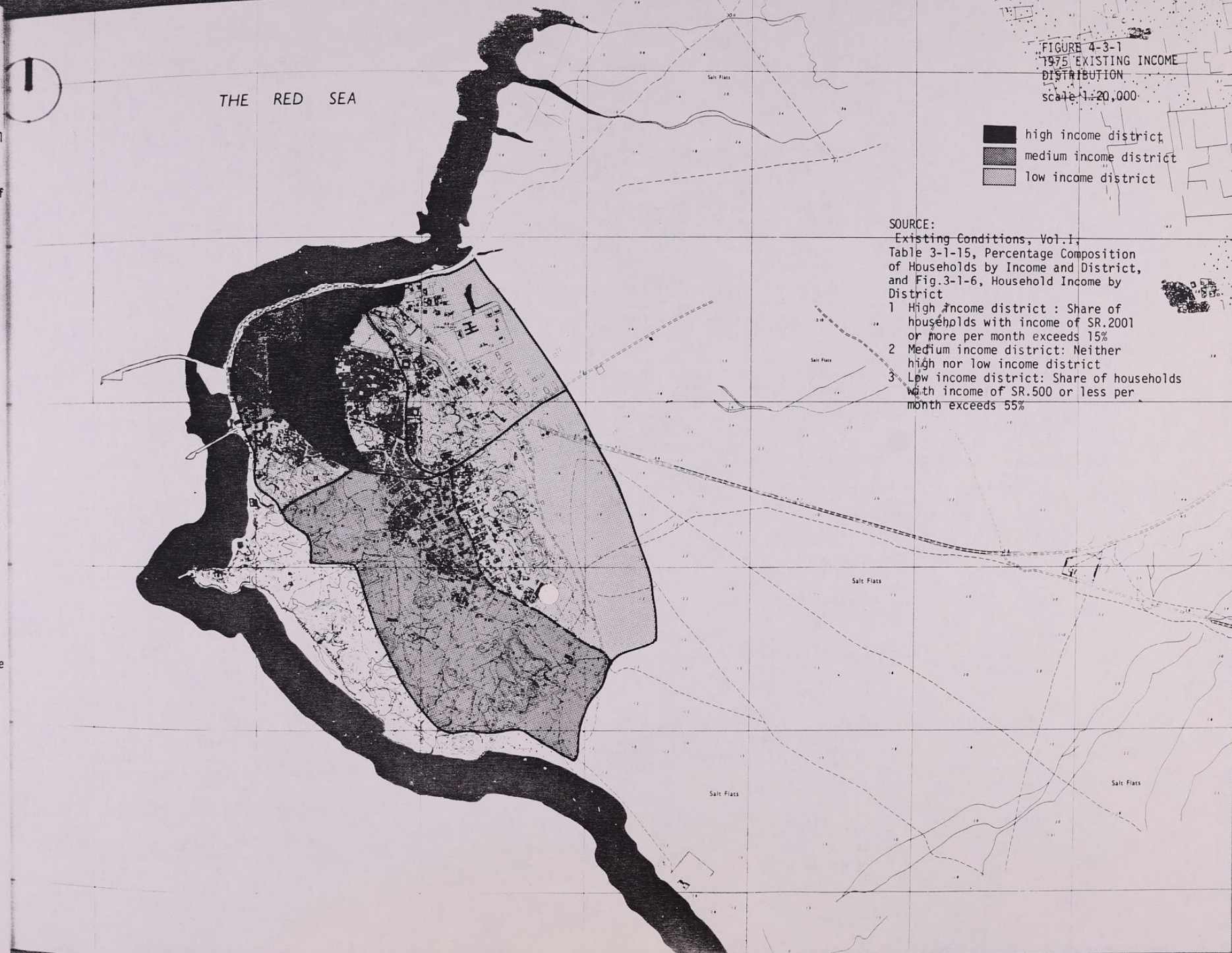
FIGURE 4-1-1  
PROJECTED  
GROWTH OF  
EMPLOYMENT  
SECTORS

FIGURE 4-3-1  
1975 EXISTING INCOME  
DISTRIBUTION  
Scale 1:20,000

high income district  
 medium income district  
 low income district

SOURCE:  
Existing Conditions, Vol.I,  
Table 3-1-15, Percentage Composition  
of Households by Income and District,  
and Fig.3-1-6, Household Income by  
District

- 1 High income district : Share of households with income of SR.2001 or more per month exceeds 15%
- 2 Medium income district: Neither high nor low income district
- 3 Low income district: Share of households with income of SR.500 or less per month exceeds 55%



THE RED SEA

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2. the southern area of the city is a medium income district
3. the eastern part of the city bordering the eastern salt flats is a low income district.

#### 4-3-2 PROJECTED GROWTH

At the present time, government employees are generally better paid than other employees. This is basically due to the nature of the city economy, which is heavily supported by and expanded by infusion of resources through the Government. However, as the primary, industrial and commercial sectors expand and the general level of income in Jizan is increased, a more even distribution of income should result.

Also, as income re-distribution plans by the Government continue into the future, this should also bring about a more equitable income distribution in Jizan.

#### 4-3-3 SKILLS AND TRAINING

Of the current population of Jizan, those who completed higher education (above secondary school) reaches 12% for the male population of age 30 to 34, 6% for males in the age group from 25 to 29, and as low as 2% for males in the age group 20 to 24. As of 1975, no woman is known to have completed higher education.

Also, no one is known to have completed vocational school. This is due to the lack of opportunity in this area.

There is a teacher training school which is offering higher education in the city. Thus far, the school offers courses up to the third grade. The enrollment in early 1975 was 114 persons in the first grade, 137 in the second grade, and 91 in the third grade.

#### 4-4 INDUSTRIAL LOCATION

##### 4-4-1 EXISTING CONDITIONS

Jizan is a city which is truly famous for its crafts, such as weaving, hats, and Koofia-making, and for its pottery. However, its manufacturing remains undeveloped except for ice-making and tile production.

##### 4-4-2 INDUSTRIAL DEVELOPMENT

Once feasibility studies are completed, Jizan should concentrate on the development of leading industries. Promising areas are Petromin's planned bulk plant, and plans for a cement plant in Jizan.

The Saudia Arabian National Transportation Survey suggests that 750,000 tons/year of cement should be produced in the Southern Region by 1985. Of this amount, it is assumed that 50% or approximately 300,000-400,000 tons/year should be produced in Jizan. Since approximately 6 ha of land are required to accommodate production of 100,000 tons/year of cement, it is recommended that approximately 18 to 24 ha be set aside in the industrial area for cement production [2].

Another industry in Jizan which has tremendous development potential is fish canning. Based on estimates of the demand and supply for fish, it is estimated that by 1995, 6,600 tons of fish will be produced per year [3]. The fish canning industry which will be needed for such a scale of fish production will require approximately 1.3 ha of industrial land [4].

With the tremendous increase in activity related to the port expected, there will be a great need for expanded warehousing facilities in Jizan in the future. Also, to accommodate the increase in activity in the industrial area, additional parking space will be needed. It is recommended that those areas with extremely poor soil conditions be used for parking.

##### 4-4-3 INDUSTRIAL LOCATION POLICY

Any policy on industrial location in Jizan must fully take into account Jizan's unique locational features. Since Jizan is basically a port city, industrial land should be located so as to facilitate port-related activities. For example, the fishery and fish processing industry should be located adjacent to the port. Also, the cement and construction industries should be located close to the port so as to reduce the costs and inconvenience of transportation of heavy materials. Because Jizan has an abundant endowment of rock salt, it is recommended that land reserved for salt mining be cleared for extraction.





Other industries should be appropriately moved to the new Jizan. Obviously, since the new Jizan will probably be free of salt flats, agriculture should flourish in the new location. Indeed, almost all agro-industries can be expected to expand in the new Jizan. It is also recommended that slaughtering and meat packing, and many petroleum-based industries be located in the new Jizan.

In Existing Jizan, there are three major factors to be considered in location of industrial activities:

1. Historical and geographic advantage.
2. Transportation and accessibility.

FIGURE 4-4-1  
EXISTING AND  
1995 PROPOSED  
INDUSTRIAL AREAS

scale 1:20,000

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-  proposed
-  salt-mine
-  warehousing and industrial development related to port activity

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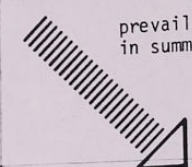
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THE RED SEA



SOURCE:  
Existing industrial areas from  
Existing Conditions, Vol.I, Secs.  
4-4-1, 4-4-2, and 4-5-2, and Vol.II,  
Fig.4-1, Land Use, and Fig.5-1,  
Building Use

3. Environmental impact, especially by wind, on surrounding communities.

All the major industrial locations in the city, however, are largely determined by the first two factors:

1. Port related warehousing and industry must be located adjacent to the existing port facilities.
2. Petromin reservoirs are already situated in the southeastern area, equipped with off-shore pipe facilities.
3. Salt mine reserve land has been designated for ease in extraction.
4. Fishery port is still to be constructed, but, since fishing boats must avoid conflict with sea currents as well as other vessels, the northern shore of the promontory is the principal candidate for the location of this port.

Although the basic locations of industries are largely determined by non-environmental considerations, it is possible to ameliorate the negative effects due to wind. First, fish processing and related industries should be located as far east on the northern shore as possible. This will minimize any odors carried by the northwest summer wind on the proposed eastern residential neighborhood (planning district 1.2). Second, by low-lying lands and building on higher ground, odors and smoke carried by wind can again be minimized. Third, between the fish processing facilities and the residential area, there should be warehousing and distribution facilities which can act as buffers. By these measures, the negative effects of industrial activities due to wind may be reduced.

#### 4-4-4 INDUSTRIAL LAND USE

In general, therefore, it is recommended that the following industrial land uses be adopted for the planning of Jizan:

1. The northern coast of the city should be reserved for fishing and fisheries industries.
2. The existing central district from the piers to the hills east of the large cemetery should eventually be cleared and replaced by:
  - a. Large-scale industrial and warehousing uses, directly linked to the port, where soil is stable, and
  - b. Open areas for industrial uses, where soil is unstable.
3. All activities not related to the port should be relocated to the new Jizan.

Table 4-4-1  
PROJECTED INDUSTRIAL AREA REQUIREMENTS, EXISTING JIZAN

	1975 Existing <sup>a</sup>	1980	1985	1995
Employment in Secondary Sector <sup>b</sup>	220	570	830	1,060
Employment in Manufacturing <sup>c</sup>	100	340	500	640
Estimated Industrial Area Requirement <sup>d</sup>	4.3	13.6	20.0	25.6

Notes:

- a. Figures for 1975 are from Jizan, Existing Conditions, Vol I, Tables 3-2-1, 3-2-2, and 4-2-1.
- b. From Table 4-1-1 (b)
- c. Assumed to be 60% of employment in secondary sector for 1980 and beyond.
- d. Estimated at 25 employees/ha for 1980 and beyond.



#### 4-5 FISHERY DEVELOPMENT

##### 4-5-1 EXISTING CONDITIONS

There are approximately 350 fishing boats in Jizan, with an annual harvest of about 1,500 tons per year, making Jizan second only to Jeddah in the volume of fish caught in the Red Sea [5].

Fishing is confined largely to an area of about 10,000 km<sup>2</sup> between the coast and the coral reefs of Farasan Islands. This is a potentially rich fishing ground which has not yet been exploited to capacity by the relatively simple boats being used by the Jizan fishermen.

Possible steps to increase the economic scale and importance of fishery in Jizan are:

1. Organization of the fishing trade into cooperatives or similar groups to provide a base for the development of the industry.
2. Government incentives and subsidies for the purchase of a more modern fleet, particularly larger boats that can go out further and remain longer at sea.
3. Updating of equipment and techniques.
4. Development of expanded markets for fish and fish products.
5. Development of processing and transport systems.

Thus development of the fishery industry requires a simultaneous effort to increase demand as well as production and transport. For planning of Existing Jizan, it is assumed that this effort will be undertaken and that the scale and complexity of fishing operations will increase.

In particular, it is proposed that a new port for exclusive use by fishing boats be constructed in Jizan. Such a port should be located on the northern coast of the Jizan promontory for the following reasons:

1. The northern coast of the promontory has traditionally been, and remains today, the primary community of fishermen.
2. The south and the west coasts of the promontory will see an increasing traffic of freight and other vessels, and a greater number of fishing boats may conflict with such vessels.
3. Despite the projected introduction of a modern fleet of motor-driven boats, it is expected that many fishing boats will remain relatively small. For these boats, the northern coast offers more protection from the currents of the Red Sea than the other coasts.
4. Finally, the eastern section of the northern coast will minimize the potentially negative

environmental impacts due to odor carried by wind.

It is also expected that related industries will be established in the area adjacent to the fishing port, including boat repair, supplies, ice-making, and canning. Fish canning will be the most important among these related activities.

The 1973 Development Plan for the Southern Region has estimated that the national demand for fish is around 31,000 tons per year, which, according to the most conservative estimate, is expected to increase 3.3 times by 1995 [6]. If it is assumed that Jizan will maintain its share of the fishery market, production in Jizan should increase from the present 1,500 tons/yr. to 6,600 tons/yr. Land area requirement for processing and canning of this amount will exceed 1.3 ha, as already noted in Sec. 4-4-2.

##### 4-6 JIZAN PORT

The future economy of Jizan is determined almost exclusively by the adequacy of its port. Since the principal economic advantage of Jizan is its access to the Red Sea, port improvement must take precedence among the many requirements for public investment.

There are three categories of activities which must be accommodated in Jizan port:

1. Freight and cargo handling.
  2. Fishing.
  3. Resort and recreation.
- Special equipment as well as support facilities are required for each category, and land uses in the city must be functionally related to the water front activities.

The Jizan Port expansion program was recently completed. There are at present 2 berths, length, 120 m and 60 m, and depth, 6 m, where 2,000 ton ships are able to dock. The total handling capacity of the port is 100,000 to 120,000 tons per year [7].

In 1973, Jizan Port handled 41,000 tons of cargo. The total volume of cargo in February 1975 was 9,736 tons [8], almost three times as much cargo as the monthly average of 1973.

The Second Development Plan recommends the addition of two berths by 1980, sea walls and required facilities, with dredging as necessary [9]. The Saudi Arabia National Transport Survey has recommended a total of 6 berths for the port of

JIZAN

1995

1,060

640

25.6

I, Tables 3-2-1,

980 and beyond.

Jizan by 1990, with a handling capacity of 500,000 tons per year [10].

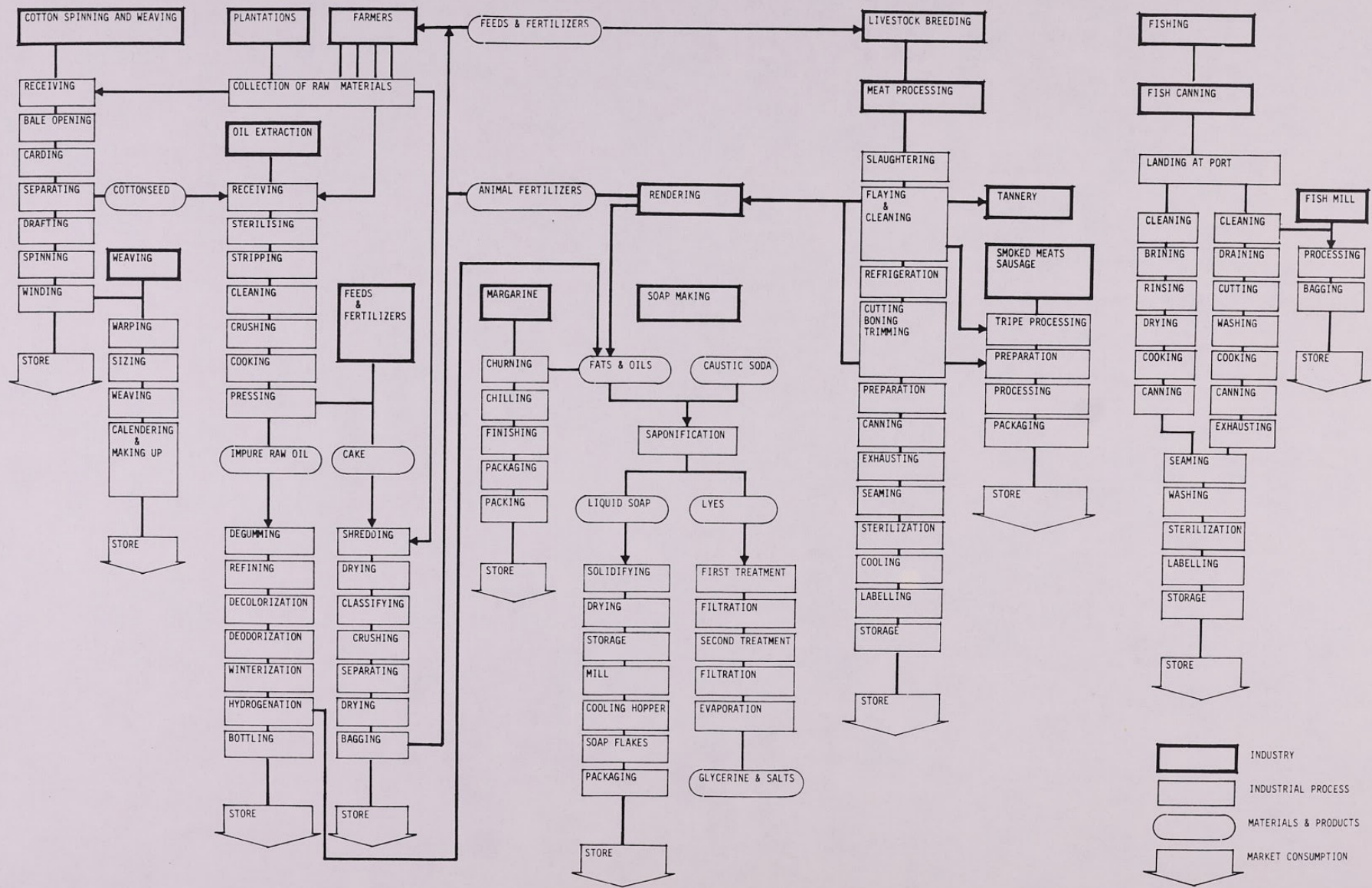
Currently, ships in Jizan are already relying on alternate means of unloading their cargo. Additional berths with proper dredging and port equipment are urgently needed. In order to relieve port congestion, it is recommended that barge carrying vessels (BCV) be considered for use in Jizan. At the same time, proper warehousing and temporary storage areas must be immediately provided to enable effective use of the existing berths.

A successful development of the fisheries industry requires that large, functionally organized quays be provided for unloading, fueling, and stocking of supplies. In order to avoid undue congestion in the port of Jizan, it is recommended that a separate fishing port be constructed on the north shore of the city. The facilities necessary for an orderly unloading, preservation, and marketing of the catch can be provided in the immediate vicinity of the fishing port.

In order to foster the growth of a resort industry on the Farasan Islands and a base for marine recreation in Jizan, it will be necessary to create facilities for commercial ferries as well as private boats. It is therefore recommended that a marina be constructed on the western coast of the city.

CHAPTER 4: NOTES

1. Jizan, Existing Condition, Vol. I, Sec. 3-2.
2. Manual of Industrial Project Analysis in Developing Countries, Annex to Volume I, Industrial Profiles, p. 163.
3. ILACO (International Land Development Consultant B.V.), Socio-Economic Development Plan for the southwest Region of Saudi Arabia, 1393/1394 - 1399/1400 (1973/74 - 1979/80)
4. Manual of Industrial Project Analysis in Developing Countries, Annex to Volume I, Industrial Profiles, p. 81.
5. For a fuller discussion of fishing and fishery development, see Southern Region, Preliminary and Final Physical Plans, Sec. 6-4.
6. ILACO (International Land Development Consultant B.V.), Socio-Economic Development Plan for the Southwest Region of Saudi Arabia, 1393/94 - 1399/1400 (1973/74 - 1979/80).
7. Southern Region, Existing Conditions, Volume I Sec. 7-3.
8. Jizan, Existing Conditions, Volume I, Sec. 7-1-6.
9. Ministry of Planning, Second Development Plan, 1395 - 1400 (1975 - 1980), Sec VII. A.2.3.4.
10. Saudi Arabia National Transport Survey, 1974.





5. civic, cultural, and commercial centers

## 5-1 GENERAL EDUCATION

## 5-1-1 EXISTING CONDITIONS

At present, the following boys schools exist in Jizan: 6 elementary, 2 intermediate, and 1 secondary schools. According to a survey of these schools conducted by the consultant, there are 2,133 elementary, 470 intermediate, and 201 secondary school students [1], which implies a 100% attendance in elementary education and approximately 60% and 20% attendance in intermediate and secondary education. Most of the schools are old and have been long-established.

For girls, there are 2 elementary and 1 intermediate schools, being attended by 1,390 and 278 students, respectively. The estimated attendance rates are somewhat lower than those of boys. About 75% and 33% of the expected school age girls attend the elementary and intermediate schools.

Although much progress has been made in general education, there are still disparities in school sizes, principally because of land shortage. New construction must pay particular attention to local soil conditions.

## 5-1-2 PROJECTED ENROLLMENT AND FACILITIES

There are three components to the educational planning methodology of the present study:

1. Population projections (Chap. 4) as the principal basis for educational planning.
2. Grouping of projected populations into a hierarchical order of communities, called the Community Structure.
3. Recommended Standards for enrollment and physical facilities.

Specific, numerical guidelines are available in the Planning Standards Appendix. Following are some general comments on methodology.

From a study of the population structure of the five cities in the Southern Region, the expected number of children per hundred population has been computed for each age group. By applying the appropriate coefficients, the total numbers of school age population eligible to enroll in the primary, intermediate, and secondary schools may be determined. Recommended target enrollment rates produce the total projected enrollment at each educational level, and the size of the resident population and that of the expected enrollment determine a grouping of population into appropriate school districts.

The target rates of school enrollment for 1980 and beyond are 100% for elementary boys and girls schools, 100% for intermediate boys and girls schools, 50% for secondary boys schools, and 30% for secondary girls schools. Although there may be some difficulty in achieving these rates by

Table 5-1-1  
PROJECTED GENERAL EDUCATION AREA REQUIREMENTS  
ELEMENTARY SCHOOL, EXISTING JIZAN

	1975 <sup>a</sup>	1980	1985	1995
Planning Population of Existing Jizan	22,160	26,000	20,000	8,000
<b>Boys</b>				
No. of School Age Population <sup>b</sup>	2,700	3,100	2,400	960
No. of Students	2,700	3,100	2,400	960
No. of Schools	6	7	6	2
Total Floor Area (m <sup>2</sup> ) <sup>c</sup>	12,200	14,000	10,800	4,300
Land Area for Building (ha) <sup>d</sup>	3.2	3.7	2.9	1.2
Playground Area (ha) <sup>e</sup>	5.4	6.2	4.8	1.9
Total Land Area (ha)	8.6	9.9	7.7	3.1
<b>Girls</b>				
No. of School Age Population <sup>b</sup>	2,700	3,100	2,400	960
No. of Students	2,700	3,100	2,400	960
No. of Schools	6	7	6	2
Total Floor Area (m <sup>2</sup> ) <sup>c</sup>	12,200	14,000	10,800	4,300
Land Area for Building (ha) <sup>d</sup>	3.2	3.7	2.9	1.2
Playground Area (ha) <sup>e</sup>	5.4	6.2	4.8	1.9
Total Land Area (ha)	8.6	9.9	7.7	3.1
<b>Total Elementary Schools</b>				
No. of Schools	12	14	12	4
Total Floor Area (m <sup>2</sup> )	24,400	28,000	21,600	8,600
Total Land Area (ha)	17.2	19.8	15.4	6.2

## Notes:

- Figures for 1975 indicate the required number and size of schools, if the recommended standards are to be satisfied.
- Assume 19% of the total population will be in age groups 6 to 11.
- Based on 4.5 m<sup>2</sup>/student. See Planning Standards, Sec. A-2-1-2 and A-2-1-3.
- Land area for building includes building area (building coverage), vehicular and pedestrian circulation (including parking), and minimum setbacks and landscaping. 20 m<sup>2</sup>/student is recommended.
- Playground area at 20 m<sup>2</sup>/student. See Planning Standards, Sec. A-2-2-4.



THE RED SEA

FIGURE 5-1-1  
GENERAL  
EDUCATION  
SCHOOL  
DISTRICTS

scale 1:20,000

- boys elementary school
- girls elementary school
- ▨ elementary school district
- ▲ boys intermediate school
- △ girls intermediate school
- ▭ intermediate school district
- boys secondary school
- girls secondary school

NOTE:

- 1 Elementary, intermediate, and secondary school districts correspond to neighborhood, sub-communities, and communities, respectively, as noted in Sec.3-2-1, Community Structure, and Table 3-1-3, Community Structure and Facility Distribution.
- 2 Schools with ○ are existing schools. See Existing Conditions, Vol.II, Fig.5-1, Building Use.
- 3 Schools without accompanying symbols have been proposed and approved by the Ministry.
- 4 Schematic locations of schools (\*) are proposed by the Master Plan. Exact locations must be determined by detailed studies. see text.

995

9,000

960  
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Compared to the endemic diseases mentioned above, there is a smaller incidence of epidemic diseases such as cholera, diphtheria, and typhoid. Cases of tuberculosis in various stages of advancement also exist. Patients suffering from these latter diseases require special treatment in isolation. There is a special hospital at Al Asan Area east of Abha for this purpose.

The primary sources of health problems in Jizan are the poor hygienic conditions of the living areas. Drinking water is often scarce or contaminated by man and animal; garbage disposal is not complete; flies and mosquitoes abound; untreated sewage often overflows the private cesspools. The major effort should be directed toward improving the lining condition of the city.

## 2. Existing Health Facilities

There are at present two general hospitals in Jizan: a 143 bed hospital at the center of the downtown area and a newly constructed hospital east of the city, which has been abandoned due to soil and flooding problems. There is one red crescent office and two quarantine stations, one at the airport and one at the Jizan port. The locations of these facilities are described in a previous report [3]. In addition, there is a 50 bed hospital in Sabya, some 27 km north of Jizan.

## 3. Projected Health Care Requirements and Proposed Facilities.

Plans have been made to construct a new general hospital of 400 to 500 beds in the vicinity of Jizan, to supplement the existing general hospital. The Ministry of Health is also planning to construct in Jizan a hospital for obstetrics and gynecology, a hospital for accidents, a hospital for fever and communicable diseases, and a hospital for leprosy [4]. For other areas of the Tihama sub-region, the Ministry of Health Plans to construct in addition two hospitals for obstetrics and gynecology, a hospital for accidents, and a hospital for fever and communicable diseases. Estimated sizes of these facilities and their phasing have been summarized in Table 5-2-3 (b).

It is proposed that all of the hospitals planned for Jizan be constructed either in New Jizan or in the vicinity of New Jizan, since:

1. After relocation, most residential and social service facilities will be located in New Jizan.

2. There is lack of suitable soil and land in Existing Jizan.
3. New Jizan will presumably enjoy greater accessibility to the hinterlands of the Tihama sub-region, which is the principal service area of the proposed facilities.

At the local level in Existing Jizan, however, a number of secondary health facilities should be provided. For each neighborhood, it is recommended that one pharmacy or one general practitioner be available. A diagnosis and treatment center should be established for use by the remaining residents of Existing Jizan. Finally, the existing general hospital in Jizan should be maintained to serve not only the residents of the city but also the special needs of foreigners entering the Kingdom by air and by sea. The existing quarantine stations should be expanded and improved for a more careful control of diseases originating in areas outside the kingdom.

Phased area requirements of neighborhood and community health facilities are summarized in Table 5-2-3 (a).

## 5-2-4 PUBLIC ADMINISTRATION

Being the capital of Jizan province, Jizan has 18 administrative facilities located throughout the city. Presently, there are three clusters of facilities: one is located east of the large cemetery; a second is located immediately south of the old pier on the west coast of the promontory; and the third is located south of the abandoned hospital and northwest of the main traffic circle. There are other facilities dispersed throughout the old section of the city.

Because of the inability to obtain open land in the past, consolidation of government facilities has been impossible. As a part of general planning of the city, it is recommended that space be allocated for a civic center in New Jizan.

It is here assumed that government facilities, along with residential development, will be some of the first to be constructed in New Jizan. With the exception of customs, immigration, inspection, and other agencies specifically related to the airport, the port, and public security, it is expected that all major administrative functions will be relocated.

There are currently 2,120 government workers in the city of Jizan. It is assumed that 50% of all government workers are employed in public administration. By 1980, government workers will increase to 2,600, and administration workers to



1980, assumption of these rates is justified by the following, temporary characteristics of existing general education in the Southern Region:

1. Currently, there are some discrepancies between the ages of some students and their grade levels in school. This is due to irregular entry ages in the past and to some instances of uneven balance.
2. Because there are few schools outside the city, many children from the surrounding rural areas also attend the schools in the city. As schools are built in rural areas, it is expected that the children will be able to attend schools in their own neighborhoods.

Thus, for Jizan in 1995, there will be two elementary schools for boys, two elementary schools for girls, one intermediate and one secondary schools for boys, and one intermediate and one secondary school for girls.

Since there will be a significant change in the distribution of population as relocation takes place, it is recommended that school district boundaries be reconsidered every year until a stable settlement of the target neighborhoods 1.1 and 1.2 are completed. As relocation proceeds, schools, as well as other community facilities, must also be relocated.

Numerical projections of school sizes and area requirements have been made on the basis of standards contained in Appendix Planning Standards, and summarized in Tables 5-1-1, 5-1-2, and 5-1-3.

### 5-1-3 PROPOSED LAND USE

In general, schools should be located near the centers of the particular community units which they serve, and boys schools must be separated from girls schools. When there are existing schools or schools whose location have been planned and approved, the Master Plan has almost always followed suit. Thus the new girls schools in the northern and southern parts of planning district 1.2 should be retained for continued use.

## 5-2 PUBLIC AND INSTITUTIONAL FACILITIES

### 5-2-1 HIGHER AND SPECIAL EDUCATION

Most of Jizan's population and its institutional facilities are expected to be relocated in New Jizan. Thus, apart from technical programs for

boys and girls residing in Existing Jizan, it is assumed that all higher and special education facilities will be established in New Jizan. It is important to reserve large tracts of land in New Jizan accessible from major roads, since students attending these facilities come from both urban and rural areas of Tihama sub-region.

Thus teacher training schools in Existing Jizan are assumed to be re-established in New Jizan, with an expanded enrollment. Technical programs are retained in Existing Jizan, since such programs can greatly benefit from proximity to actual workplaces and major transport activities.

The projected 1995 area requirements for higher and special education facilities in New Jizan are given in Table 5-2-1 (a). Area requirements for technical schools in Existing Jizan are given in Table 5-2-1 (b).

### 5-2-2 MOSQUES

Mosques are arranged hierarchically according to community structure. By 1995 each neighborhood should have a mosque and each sub-community a Jami'a mosque. The mosques should be located near the centers of the community units which they serve. Educational and cultural facilities should be closely linked to the mosques in order to foster an integration of religious and educational functions. See Table 5-2-2 for projected area requirements for religious facilities.

### 5-2-3 HEALTH CARE

#### 1. Current Health Problems

The principal endemic diseases of the Tihama area are malaria and bilharzia [2]. Malaria is a disease marked by recurring chills and fever and caused by a parasite carried by a mosquito. Malaria occurs largely in hot climate characteristic of Jizan and the coastal Tihama. Bilharzia, also known as schistosomiasis, is caused by a different parasite contracted by drinking contaminated water or swimming in contaminated areas. Neither malaria nor bilharzia, however, are considered communicable diseases, and patients suffering from such diseases do not require isolation. Preventive measures are urgently needed, especially by controlling the mosquito population, by improving the quality of drinking water, and by improving the nutrition and general living conditions.



1,300, but, because of relocation, government employment will peak in 1985 at 2,660 and decline to 2,220 by 1995, with administrative workers assumed to follow the same trend with 1,330 in 1985 and 1,110 in 1995

It is very desirable to have all governmental offices at a single location. This would facilitate the coordination of government activity. For projected area requirements of government administrative facilities, see Table 5-2-4.

Table 5-2-1 (a)  
1995 PROJECTED HIGHER AND SPECIAL EDUCATION AREA REQUIREMENTS  
NEW JIZAN

	No. of Students	No. of Schools	Total Floor Area	Total Land Area (ha)
Teachers' School	720 <sup>a</sup>	1	5,760 <sup>b</sup>	2.1 <sup>c</sup>
General College	1,000 <sup>d</sup>	1	15,000 <sup>e</sup>	7.5 <sup>f</sup>

Notes:

- a. Ministry of Education recommends a Teachers' School of 30 students/class x 24 classes = 720 students.
- b. Based on 8 m<sup>2</sup>/student. See Planning Standards, Sec. A-2-1-8.
- c. Based on 30 m<sup>2</sup>/student. See Planning Standards, Sec A-2-1-8/
- d. Assume average-sized college. See Planning Standards, Sec. A-2-1-11.
- e. Based on 15 m<sup>2</sup>/student. See Planning Standards.
- f. Based on 75 m<sup>2</sup>/student. See Planning Standards.



Table 5-2-3 (a)  
PROJECTED HEALTH FACILITIES AREA REQUIREMENTS  
NEIGHBORHOOD AND SUB-COMMUNITY FACILITIES,  
EXISTING JIZAN

	1975 <sup>a</sup>	1980	1985	1995
Planning Population of Existing Jizan	22,160	26,000	20,000	8,000
Neighborhood Pharmacy				
No. of Facilities <sup>b</sup>	6	7	6	2
Total Floor Area (m <sup>2</sup> ) <sup>c</sup>	1,100	1,300	1,000	400
Total Land Area (ha) <sup>d</sup>	0.6	0.7	0.6	0.2
Sub-Community				
Diagnostic & Treatment Center	6	7	6	2
No. of Facilities <sup>e</sup>	1	1	1	1
Total Floor Area (m <sup>2</sup> ) <sup>f</sup>	1,100	1,300	1,000	400
Total Land Area (ha) <sup>g</sup>	0.7	0.8	0.6	0.2
<b>Total</b>				
Total Floor Area (m <sup>2</sup> )	2,220	2,600	2,000	800
Total Land Area (ha)	1.3	1.5	1.2	0.4

Notes:

- Figures for 1975 indicate the number and size of facilities, if the recommended standards are to be satisfied.
- One pharmacy per neighborhood. See Planning Standards, Sec. A-2-5-1.
- Based on 0.05 m<sup>2</sup>/inhabitant. See Planning Standards.
- Based on 0.1 ha per pharmacy. See Planning Standards.
- One diagnostic and treatment center per sub-community. See Planning Standards, Sec. A-2-5-2.
- Based on 0.01 m<sup>2</sup>/inhabitant. See Planning Standards.
- Based on 0.3 m<sup>2</sup>/inhabitant. See Planning Standards.

Table 5-2-3 (b)  
PROJECTED HEALTH FACILITIES AREA REQUIREMENTS  
COMMUNITY AND SUB-REGIONAL FACILITIES, COMBINED JIZAN

	1975	1980	1985	1995
Extended Service Area				
Planning Population <sup>a</sup>	32,800	38,000	43,000	58,000
Recommended Size of Community General Hospital				
No. of Beds <sup>b</sup>	110	130	150	200
Recommended Size of Special Hospital				
No. of Beds <sup>c</sup>	100	110	130	170
Existing General Hospital <sup>d</sup>	143	143	143	143
No. of Beds	143	143	143	143
Land Area (ha)	1.0	1.0	1.0	1.0
Proposed New General Hospital				
No. of Beds		400-500	400-500	400-500
Land Area (ha) <sup>f</sup>		24.4	24.4	24.4
Proposed Obstetrics and Gynaecology Hospital <sup>e</sup>				
No. of Beds	-	-	-	100-200
Land Area (ha) <sup>g</sup>	-	-	-	8.1
Proposed Hospital for Accidents				
No. of Beds	-	-	-	100
Land Area (ha) <sup>g</sup>	-	-	-	5.4
Proposed Hospital for Fever and Communicable Diseases <sup>e</sup>				
No. of Beds	-	-	100	100
Land Area (ha) <sup>f</sup>	-	-	10.1	10.1
Proposed Hospital for Leprosy				
No. of Beds	-	-	-	100
Land Area (ha) <sup>g</sup>	-	-	-	5.4
Existing and Proposed Facilities				
Total Land Area (ha)	1.0	25.4	35.5	54.4

Table 5-2-3 (b) Notes on the next page.

Table 5-2-3 (b)

## Notes:

- a. Population of Jizan according to the 1974 National Census. It is assumed that the population covered by URTEC 5% Survey will grow at the rate already indicated for Combined Jizan. Population of greater Jizan outside the survey area is assumed to grow at the same rate as the rural population of Tihama sub-region. See Southern Region, Preliminary and Final Physical Plans, Table 9-3-3.
- b. Recommended standard is 3.5 beds/1,000 inhabitants. See Planning Standards Sec. A-2-5-3.
- c. Recommended standard is 3 beds/1,000 inhabitants. See Planning Standards, Sec. A-2-5-4. The figures for both general and special hospitals are the minimum level health services required. The program of facilities proposed by the Ministry of Health exceeds the minimum required.
- d. Existing hospital in Jizan. The abandoned hospital has been excluded.
- e. Information on proposed hospitals obtained from Ministry of Health, Southern Region, and Health Office, Abha. All proposed hospitals are assumed to be constructed in New Jizan or its vicinity. Phasing is suggested.
- f. Based on information obtained from Ministry of Health. See Jizan, Existing Conditions, Vol I, Sec. 4-7.
- g. Estimated at land area per bed approximately equal to that of the proposed new general hospital.

Table 5-2-4  
PROJECTED PUBLIC ADMINISTRATION AREA REQUIREMENTS  
EXISTING JIZAN

	1975 <sup>a</sup>	1980	1985	1995
Employment in Government Sector <sup>b</sup>	2,130	2,600	2,660	2,220
Employment in Public Administration <sup>c</sup>	1,065	1,300	1,330	1,110
Total Floor Area (m <sup>2</sup> ) <sup>d</sup>	16,000	19,500	20,000	16,700
Total Land Area (ha)	0.8	1.0	1.0	0.8

## Notes:

- a. Area requirements for 1975 are those which would be required to satisfy the recommended standards.
- b. From Table 4-1-1 (b).
- c. Assumed to be one-half of total government employment.
- d. Based on 15 m<sup>2</sup>/employee. See Planning Standards, Sec. A-2-7-4.
- e. Based on 7.5 m<sup>2</sup>/employee. See Planning Standards.

## 5-3 CULTURAL FACILITIES

## 5-3-1 HISTORIC AND ARCHITECTURAL CONSERVATION

The unique architecture of Jizan is characterized by round, hut shelters made from mud. The rectangular houses and the later courtyard houses can be found in various locations in the city. By far the most prevalent building type is a combination of various elements, mainly characterized by a hut and other structures in a compound surrounded by reed and mud fences. These houses are unique in the Southern Region and provide a characteristic spatial aspect.

However, because of Jizan's lack of adequate sewerage and upkeep, most traditional buildings should be replaced by modern buildings with adequate facilities.

Because Jizan is treeless, its landscape appears dreary and desolate. Therefore, it is recommended that programs be established for experimental planting of vegetation suited to an arid climate and soil with high salt content.

Conservation in Jizan should be of two forms:

1. conservation of man-made structures, and
2. conservation of the natural environment, particularly the coast and the sea.

It is recommended that the vestiges of ancient forts south of the old section and the unique hut shelters be preserved. It would probably be a wise policy that the hill on which the forts stand and some sections of indigenous housing be zoned for conservation.

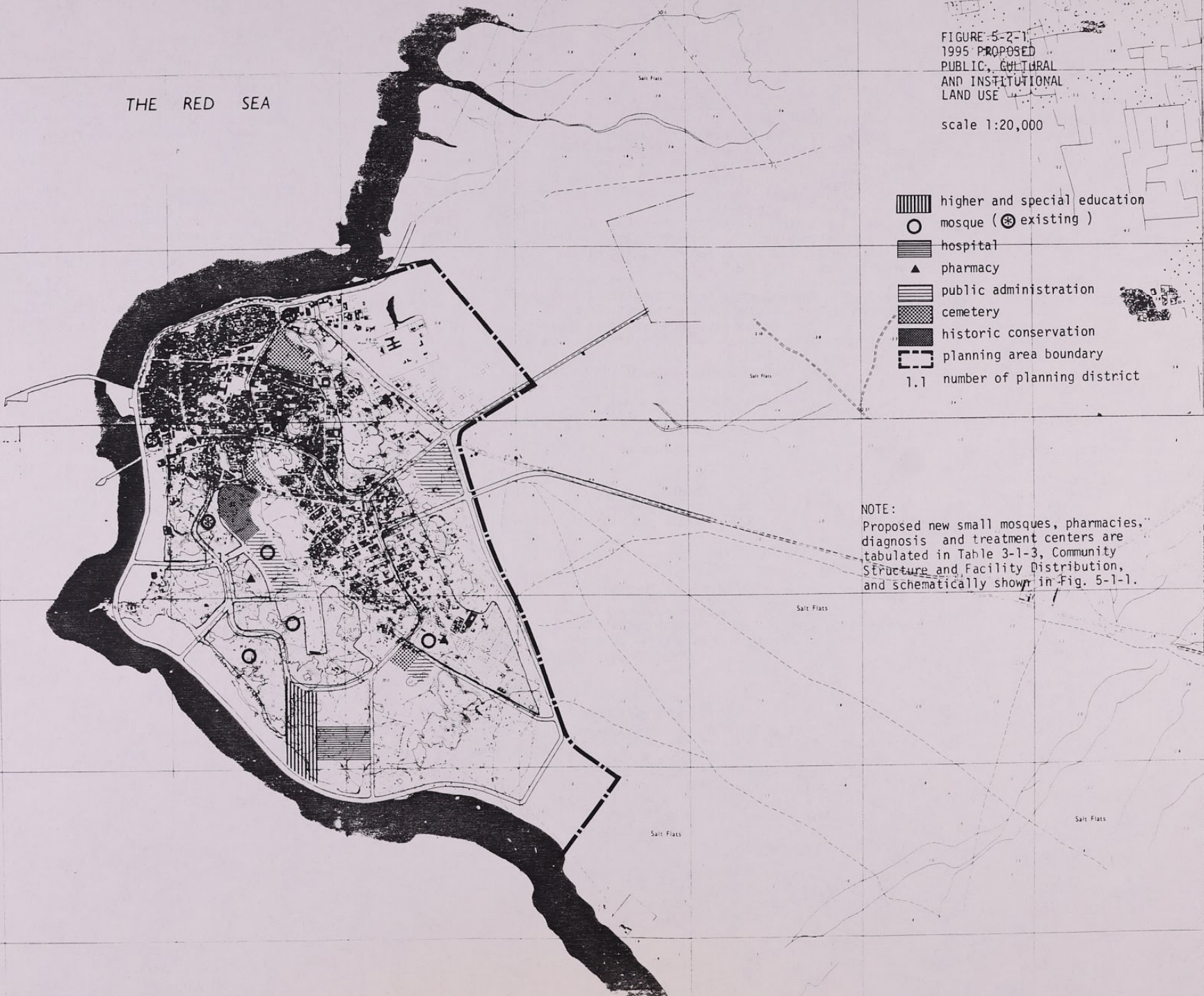
The Department of Town Planning intends to conserve a linear open space approximately 60m wide, inside of the Cornice Road, along the coastline of the city. Provisions should also be made that land fill outside of Cornice Road be prohibited, and that in general vistas and access to the sea should be kept open.



THE RED SEA

FIGURE 5-2-1  
1995 PROPOSED  
PUBLIC, CULTURAL  
AND INSTITUTIONAL  
LAND USE

scale 1:20,000



- higher and special education
- mosque (⊙ existing)
- hospital
- pharmacy
- public administration
- cemetery
- historic conservation
- planning area boundary
- 1.1 number of planning district

NOTE:  
Proposed new small mosques, pharmacies,  
diagnosis and treatment centers are  
tabulated in Table 3-1-3, Community  
Structure and Facility Distribution,  
and schematically shown in Fig. 5-1-1.

5-4 COMMERCIAL FACILITIES

5-4-1 EXISTING COMMERCIAL AREAS

Currently, there are 451 commercial facilities in Jizan, of which 263 are permanent shops and 188 temporary shops and stalls. However, on the basis of facilities per population, Jizan is the lowest among the five major cities in the Southern Region [5]. Due to the fact that Jizan is separated from the main agricultural areas of Tihama by salt flats, collection and distribution of local agricultural products are more and more being handled by Sabya, Abu Arish, and Samitah.

Essentially, there are two market areas in Jizan. One is centered around a suq located west of the large cemetery. The composition of shops in this area is similar to that of the other cities of the region. The other is a cluster of shops south of the town square and are a block east of the harbor area. Specifically, there is a mixture of wholesale and retail shops which deal in goods imported by sea, grain, and processed foods. Imported cement is also handled in this area.

5-4-2 PROPOSED DISTRIBUTION OF MAJOR COMMERCIAL ACTIVITIES

Three different scales of commercial activities are expected to take place in Jizan:

1. Wholesaling and distribution of good through the port.
2. Regional retail commercial
3. Community retail commercial.

The first set of activities will be conducted in the industrial/warehousing area designated by planning district 2.1. It will be necessary to establish a trucking and distribution center in order to facilitate the flow of goods both in and out of the Tihama sub-region.

The second set of commercial activities will be located mostly in New Jizan, which will have more stable land, infrastructure and accessibility to rural areas and the major cities of Asir. However, two forms of retail activity directed to regional or sub-regional markets may occur in Existing Jizan: (1) A retail market for imported goods entering the port and (2) a retail market for fresh fish and marine products. Both of these activities should be located near the Cornice Road in planning district 2.1.

Finally, a community retail center will be required to serve the consumer needs of the population who remain in Existing Jizan even after re-

location is completed. It is proposed that such a center be established near the middle of the promontory and east of the salt mine reserve land. This location is readily accessible both from the projected residential neighborhoods 1.1 and 1.2 and from the major regional road, Route 54 .

5-4-3 PROPOSED DISTRIBUTION OF NEIGHBORHOOD COMMERCIAL ACTIVITIES

Smaller scale retail outlets should be provided in the new residential areas based on neighborhood size and walking distance. Indeed these neighborhood shopping centers should be located at the center of the neighborhood or along the local distribution road connecting the center of the neighborhood to the sub-community. These neighborhood commercial facilities should be composed as follows: food market, drugstore, bakery, barber shop, laundry and dry cleaner, hardware, stationery and restaurant, etc.







THE RED SEA

FIGURE 5-4-1  
1995 PROPOSED  
COMMERCIAL  
LAND USE

scale 1:20,000

-  existing commercial area
-  proposed neighborhood shopping center



DUBAI - SAUDI ARABIA

Table 5-4-1  
PROJECTED NEIGHBORHOOD AND COMMUNITY COMMERCIAL REQUIRMENTS  
EXISTING JIZAN

	1975 <sup>a</sup>	1980	1985	1995
Planning Population of Existing Jizan	22,160	26,000	20,000	8,000
Neighborhood Retail				
No. of Retail Centers	6	7	6	2
Total Floor Area (m <sup>2</sup> ) (0.05m <sup>2</sup> /inhabitant)	11,100	13,000	10,000	4,000
Total Land Area (ha) (4m <sup>2</sup> /inhabitant)	8.9	10.4	8.0	3.2
Community Retail				
No. of Retail Centers	1	1	2	3
Total Floor Area (m <sup>2</sup> )	4,400	5,200	4,000	1,600
Total Land Area (ha)	2.2	2.6	2.0	0.8
-----				
Total				
Total Floor Area (m <sup>2</sup> )	15,540	18,200	14,000	5,600
Total Land Area (ha)	11.0	12.8	10.0	4.0

Notes:

- Figures for 1975 indicate the number and size of retail areas, if the recommended standards are to be satisfied.
- One neighborhood retail center per neighborhood. See Planning Standards, Sec. A-2-6-1.
- Based on sales area of 0.5 m<sup>2</sup>/inhabitant. See Planning Standards.
- Based on 4 m<sup>2</sup>/inhabitant, including parking area equal to sales area. See Planning Standards.
- One community retail center to serve Existing Jizan, See Planning Standards, Sec. A-2-6-2.
- Based on sales area of 0.2 m<sup>2</sup>/inhabitant. See Planning Standards.
- Based on 1 m<sup>2</sup>/inhabitant, including parking area twice as large as sales area. See Planning Standards.

5-5 NEIGHBORHOOD AND COMMUNITY CENTRAL AREAS

5-5-1 PLANNING POLICY

It is recommended that all of the activities in a neighborhood take place in a neighborhood central area. This central area would contain elementary schools, a playground, neighborhood park, neighborhood center, shopping center, small mosque, and pharmacy. This centrality of all activity in a neighborhood would breed cohesiveness, and therefore facilitate the flow of activities in the neighborhood.




At the higher end of the hierarchial structure, it is recommended that there be a community central area. This area would include secondary schools, a playfield ("level 2"), community park, community center, library, museum, and community shopping center. The community central area could also contain technical schools.

5-5-2 DISTRIBUTION OF FUNCTIONS.

As can be seen from Table 5-5-2, the amount of land to be used for educational facilities, recreational/athletic facilities, and commercial facilities will differ by the population in each neighborhood. Therefore, neighborhood 1.1 will have more of its land used for educational, recreational/athletic, and commercial facilities than the other neighborhood.

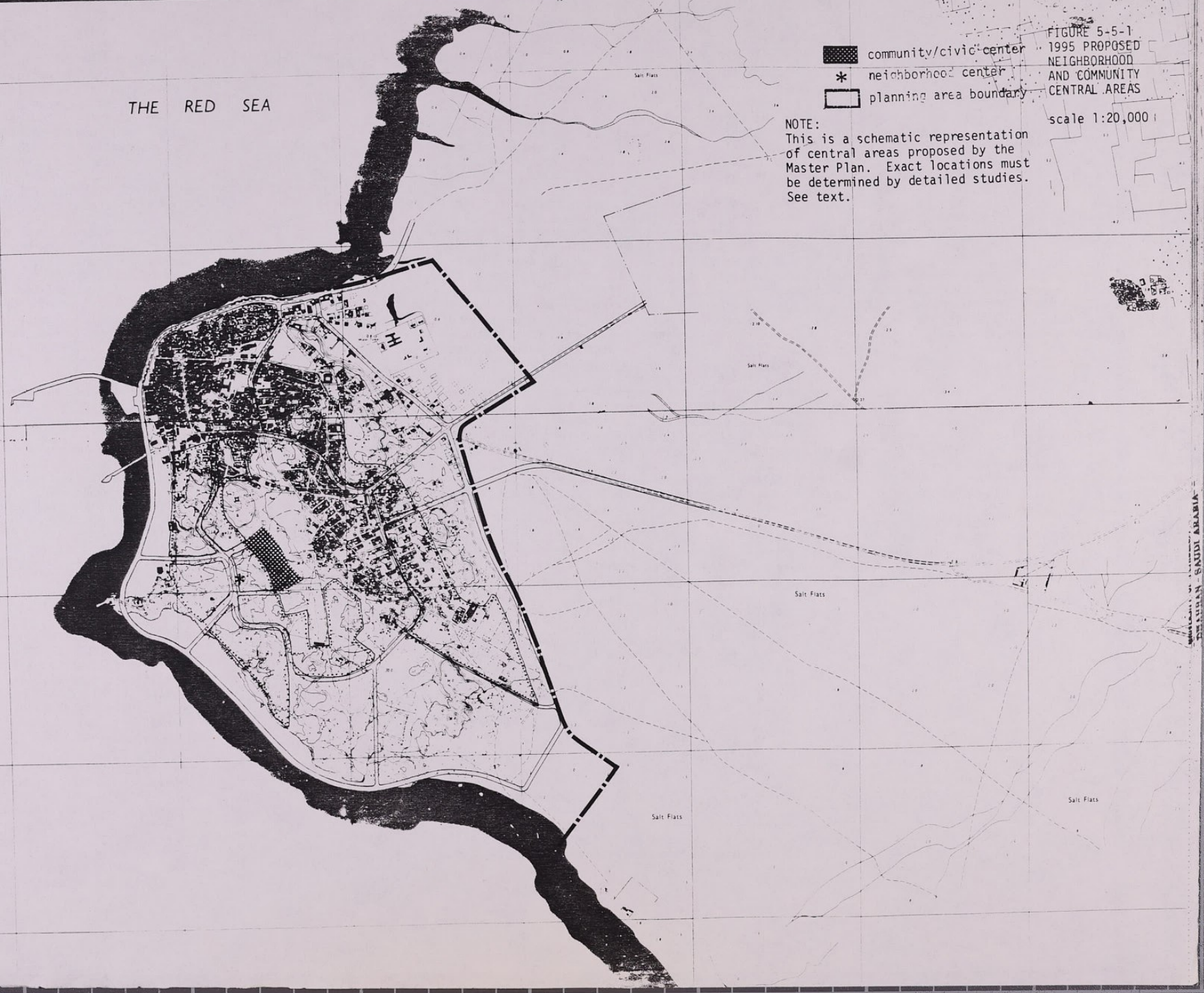
FIGURE 5-5-1  
1995 PROPOSED  
NEIGHBORHOOD  
AND COMMUNITY  
CENTRAL AREAS

scale 1:20,000

-  community/civic center
-  neighborhood center
-  planning area boundary

NOTE:  
This is a schematic representation  
of central areas proposed by the  
Master Plan. Exact locations must  
be determined by detailed studies.  
See text.

THE RED SEA



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SAUDI ARABIA

## 6-1 RECREATION

### 6-1-1 EXISTING RECREATIONAL AREAS

At the present time, Jizan's recreational areas consist of local restaurants, qahwahs (coffee and tea shops), and the coast. The city does not provide parks, playgrounds, or other public facilities.

Jizan, however, has many ways of developing its recreational facilities. It could locate public beaches on the southwestern coast of the promontory. A marina should be developed as a center for sports fishing, diving, sailing, and other marine activities.

Also, the Farasan Islands have great potential to be a large-scale resort and tourist center. These islands have many tropical plants, coral reefs, and unique villages. Because the islands do not have an airport, a ferry from Jizan is the principal means of transportation to the islands. Therefore, it would probably be wise to construct some airport facilities on the Farasan Islands as a means of increasing tourism there. In the meantime, it is recommended that a marina with a ferry landing be provided.

Finally, it is recommended that Jizan's coastal zone be preserved as much as possible for recreational uses.

### 6-1-2 POLICY AND REQUIREMENTS FOR RECREATIONAL DEVELOPMENT

There should be a policy to provide recreational areas for the city as a whole, and for each sub-group within the community hierarchy.

The space to be devoted to recreational areas should conform to the Planning Standards. The recreational areas pertaining to each sub-group of the hierarchy should be linked by pedestrian footpaths. In this way, the entire residential area of the city can be conceived of as a kind of web or network of linear access routes.

Furthermore, the recreational space of the city can be divided into two categories:

1. active; and
2. passive

Active space refers to an area programmed for certain activities, e.g., a baseball field, soccer field, or playground. On the other hand, passive space is an area not set aside for specific activities, e.g., parks and walkways connecting two areas of active space.

### 6-1-3 RECREATIONAL LAND USE

The master plan calls for recreational facilities to be provided for each sub-group within the community structure. Tot lots are to be provided for each residential group unit [1]. The main purpose of the tot lots is to create an area where infants (pre-school children 2 to 5 years old) can engage in outside play under the supervision of adults. These tot lots should be located in the center of each residential group unit and be directly accessible from each housing unit without crossing any street or access lane.

The playground should be designed as an integral part of an elementary school and should be connected to the elementary school and residential zone by footpath without having to cross major traffic. Off-school time usage by the adult population is recommended. Space should also be provided for medium size sports activities such as basketball and tennis, etc. A children's pool, fenced and equipped with locker room and shower can also be provided.

According to the planning scheme, each neighborhood should also have a neighborhood park. The objectives of creating neighborhood parks are threefold:

1. to provide an area suitable for general recreation;
2. to foster a feeling of cohesiveness in the neighborhood; and
3. to provide a common garden in which neighborhood residents can mingle;

The neighborhood park should be in the center of the neighborhood and should not be surrounded by major traffic activity. In addition, it should be connected to major neighborhood-level facilities such as the elementary school(s), neighborhood shopping center, and mosque, etc. by footpath without crossing major traffic. The park itself could be stretched along such a path to create a linear park along which neighborhood facilities can be clustered. Trees, green areas, seating areas with benches, and paved paths should be provided. It is also recommended that recreational adult swimming pool with ancillary facilities be provided.

For existing Jizan as a whole, it is suggested that a community/city park be created. Its purpose is to supply an area where weekly or monthly community activity can take place. It should also function as a medium to organically combine community-level facilities along it.

The community center should be located at the center of the community between two of the cen-

6. recreation and conservation





THE RED SEA

FIGURE 6-1-1  
1995 PROPOSED  
RECREATIONAL  
LAND USE

scale 1:20,000



- community/city park
- playfield (level 1)
- playfield (level 2)
- school playground
- neighborhood park
- park-open space network
- planning area boundary

SAUDI ARABIA

Table 6-1-1  
PROJECTED RECREATIONAL AREA REQUIREMENTS  
EXISTING JIZAN

	1975 <sup>a</sup>	1980	1985	1995
Planning Population of Existing Jizan	22,160	26,000	20,000	800
Neighborhood Recreation				
No. of Tot Lots <sup>b</sup>	96	112	96	32
Total Land Area (ha) <sup>c</sup>	4.8	5.6	4.8	1.6
No. of Nursery-Kindergarten Play Lots <sup>d</sup>	24	28	24	8
Total Land Area (ha) <sup>e</sup>	4.8	5.6	4.8	1.6
No. of Neighborhood Parks <sup>f</sup>	6	7	6	2
Total Land Area (ha) <sup>g</sup>	11.0	13.0	10.0	0.4
No. of Playgrounds <sup>h,i</sup>	12	14	12	4
Total Land Area (ha) <sup>j</sup>	10.8	12.4	9.6	3.8
Total Neighborhood Recreational Area (ha)	31.4	36.6	29.2	7.4
-----				
Sub-Community Recreation				
No. of Playfields I <sup>i,k</sup>	2	2	2	2
Total Land Area (ha) <sup>l</sup>	6.0	7.2	5.4	2.4
-----				
Community Recreation				
No. of Playfield II <sup>i,m</sup>	2	2	2	2
Total Land Area (ha) <sup>n</sup>	4.0	4.8	3.7	1.6
Community/City Park				
Total Land Area (ha) <sup>q</sup>	1	1	1	1
Total Land Area (ha) <sup>q</sup>	8.9	10.4	8.0	3.2
Total Community Recreational Area (ha)	12.9	15.2	11.7	4.8
-----				
Total Recreational Land Area (ha)	50.3	59.0	46.3	14.6
Total Recreational Area Less School Associated Playgrounds and Playfields (ha) <sup>r</sup>	29.5	34.6	27.6	6.8

Table 6-1-1

Notes:

- a. Figures for 1975 indicate the number and size of facilities, if the recommended standards are to be satisfied.
- b. Estimated on the basis of service population of 250 per tot lot. Planning Standards, Sec. A-2-2-1.
- c. 500 m<sup>2</sup>/tot lot. See Planning Standards.
- d. Service population of 1,000 per play lot. Planning Standards, Sec. A-2-2-2.
- e. 2,000 m<sup>2</sup>/play lot. See Planning Standards.
- f. One park per neighborhood. Planning Standards, Sec. A-2-2-3.
- g. 5 m<sup>2</sup>/inhabitant. See Planning Standards.
- h. One playground per elementary school. It is necessary to allocate separate playgrounds to boys and girls schools. Planning Standards, Sec. A-2-2-4.
- i. In terms of acquisition, service, and maintenance, playgrounds and playfields I and II, should included in the area requirements for elementary, intermediate, and secondary schools, respectively, since the major user of these grounds is the school athletic program. They are included here solely to illustrate the overall recreational land use of the city.
- j. 20 m<sup>2</sup>/elementary school student. See Table 5-1-1.
- k. One playfield I per intermediate school. It is necessary to allocate separate playfields to boys and girls schools. See Planning Standards, Sec. A-2-2-6.
- l. 30 m<sup>2</sup>/intermediate school student. See Table 5-1-2.
- m. One playfield II per secondary school. It is necessary to allocate separate playfields to boys and girls schools. Students from teacher training and technical schools should also have access to these fields. See Planning Standards, Sec. A-2-2-7.
- n. 50 m<sup>2</sup>/secondary school student, See Table 5-1-3.
- p. Due to the small size of Existing Jizan, the community and city parks are combined.
- q. 4 m<sup>2</sup>/inhabitant is recommended. Planning Standards, Sec. A-2-2-5.
- r. Total recreational area excluding playgrounds and playfields I and II. This area is the proper component of the city's parks and recreation program.



ters so as to connect them and create a park-open space spine on which the community center is located at the middle.

Fruit trees or agricultural land could be developed in the community park since a major function of the park is to serve as a visual buffer between the two adjacent neighborhoods and between the salt mine reserve land and the residential areas. Thus, it is recommended that the community park be extended to from a ring around the salt mine, as indicated in Fig. 6-1-1.

## 6-2 TOURISM

### 6-2-1 EXISTING CONDITIONS

The tourism industry in the Tihama sub-region is not as developed as the other sectors of the economy. However, as the general income level rises and leisure time becomes available, domestic and perhaps international tourism market will emerge. Jizan and the surrounding Tihama area have an attractive coastline, which could become a regional and national recreational area. Some of the specific opportunities are:

1. Recreational fishing, including shark and other sport fishing.
2. Observation of unique scenic sites and natural formations, including coral reefs.
3. Swimming and other water sports.
4. Access to Farasan Islands, which is itself a potentially major source of tourism.

### 6-2-2 DEVELOPMENT POLICY

In order fully to realize these resources for tourism and recreational activities, specific development policies must be adopted.

1. Establishment of an aquatic recreational area with beaches and open water free from commercial vessels.
2. Coastal conservation and beautification. It is necessary to restrict development immediately adjacent to the coast and to establish vegetation on the currently bare soil.
3. Construction of facilities for accommodating tourism and recreational activities.

These policies, however, are not applicable everywhere along the coast. The primary advantage of Jizan is its superior accessibility by air, land, and sea and relative proximity to the Farasan Islands.

### 6-2-3 PROPOSED TOURIST FACILITIES

In existing Jizan, the following tourism and recreational development projects are recommended:

1. Construction of a marina and a ferry landing, for connection to Farasan Islands, on the westernmost point in Jizan.
2. Development and construction of hotels, restaurants, and small convention or meeting facilities inland and adjacent to the proposed marina.
3. Development of sandy beaches on the southwest coast of Jizan, immediately south of the marina.
4. Conservation and beautification of infill land between the Cornice Road extension and the hilly terrain. One of the obstacles to planting the Jizan peninsula is the high salinity of its soil. There is vegetation, coconut palms in particular, which are resistant to such a condition. Such vegetation should be actively introduced and protected.
5. Preservation of historical and architectural areas and landmarks (as proposed in Sec. 5-3).

## 6-3 OPEN SPACE AND COASTAL CONSERVATION

### 6-3-1 EXISTING OPEN SPACE

Given that Jizan first developed intensively in its northern part, and that the residential area has only recently been moving southward, most of the city's open space is located in the southwestern regions. There is also a great amount of open-space along the eastern boundary of the city adjacent to the salt flats.

### 6-3-2 PROPOSED CONSERVATION AREAS

The western coastline of the city is presently being restructured by the construction of Cornice Road. The master plan advanced by the Department of Town Planning allocates in certain areas inside of Cornice Road a linear open space approximately 60 m wide. It is proposed that this zone be established so that uncontrolled development along Cornice Road will not take place. In addition to being used in the future as a site for swimming and fishing facilities, it could also be used for a city park.

In general, however, land-fill outside Cornice Road should be prohibited, and vistas and access to the sea kept open.

It is proposed that a pilot program be instituted for the planting of vegetation in the coastal conservation area and in the community park. There are various varieties of grass and trees which are resistant to salt and able to thrive on sand. In particular, coconut palms should be planted on an experimental basis. If suitable, the entire conservation area should be planted.

CHAPTER 6 NOTE:

1. A residential group unit is composed of approximately 250 people. See Planning Standard.

7. primary communication and transport

## 7-1 GENERAL

### 7-1-1 CITY LOCATION

Because of Jizan's perennial water shortage, the city as a seaport has been considered a minor trade center and restricted in its growth potential. Located on the Red Sea at the junction of the road to the southernmost corner of Saudi Arabia and to Yemen, Jizan is some 200 kilometers south of Abha, 950 kilometers southwest of Riyadh and 600 kilometers southeast of Jeddah. With respect to commerce and agriculture, Jizan is now and will continue to be a very important urban and commercial center in the Southern Region. Jizan is the only major port in the Southern Region. Consequently, the city's major function is importation, collection and distribution of agricultural and other commodities. Additional activities centered in Jizan are fishing, some farming and craft-work (i.e. pottery, weaving, etc.). Like most of the cities of the Region, commercial dependence is somewhat on Khamis Mushayt, while administrative dependence is on Abha and Riyadh. Tourism, as a possible economic activity, depends on whether or not the Farasan Islands can become an attractive maritime recreation center.

### 7-1-2 URBAN DEVELOPMENT

From the densely urbanized areas close to the port and fishing harbors, expansion of Jizan has been in the southeast direction for geographic and topographic reasons. While outward expansion has approximately doubled in the past decade, density in the old city has also increased rapidly.

Development in the old city of Jizan will concentrate on separating industrial and port development from community and residential areas. Warehousing and industrial activities are planned for the northwest section of the city adjacent to the port facilities and petroleum related activities are planned for the extreme southeastern section. In the very center of the city is the existing salt mine which will continue to be operated in the future. Around this salt mine primarily to the west, but also to the north and east, will be redeveloped residential and community areas.

It must be kept in mind that new or relocated city of Jizan will account for much of the future population growth and that large numbers of people will live in the new city and work in the old city at jobs related to the important port facilities planned there.

The successful expansion and development of Jizan

is vital if the Southern Region is to prosper as a whole. To insure this success, the need for planning a safe and efficient transportation system is essential.

## 7-2 LAND USE/TRANSPORTATION STUDY

### 7-2-1 OBJECTIVES

The principal objectives of this study are:

1. To satisfy the long term travel demands of Jizan through the establishment of an effective transportation system, and
2. To provide a practical basis for the phasing of construction relative to the expanding needs of the City of Jizan.

### 7-2-2 TRANSPORTATION PROCEDURE

The transportation planning procedure is based on the extension of present travel habits relative to known trends in national prosperity and vehicle ownership to project and predict future travel demands. Existing travel characteristics for Jizan were derived from the analysis of data obtained from home interviews and roadside traffic surveys carried out in 1975 and basic information on land use, population and employment obtained from planning surveys. Based on the available data described above, the predicted total number of trips generated and attracted to each traffic zone of the city is distributed and assigned to the road network. Thus, future highway requirements are determined and future demands for parking and terminal facilities are derived.

### 7-2-3 TRAFFIC PLANNING METHODOLOGY

Although a very detailed account of the traffic survey methodology would take far too much space to be presented here, a detailed and comprehensive survey was conducted which is outlined below:

1. Information gathering - the following classes of data were collected:

- A. Socio Economic Survey. This information was gathered as a comprehensive 5% sample survey, as called for in the agreement, and provided valuable background material applicable to both qualitative and quantitative interfacing with actual traffic data gathered in specific traffic surveys. In the course of the URTEC 5% survey conducted by this consultant certain numbers of the population of the city were interviewed in their homes, and were asked questions

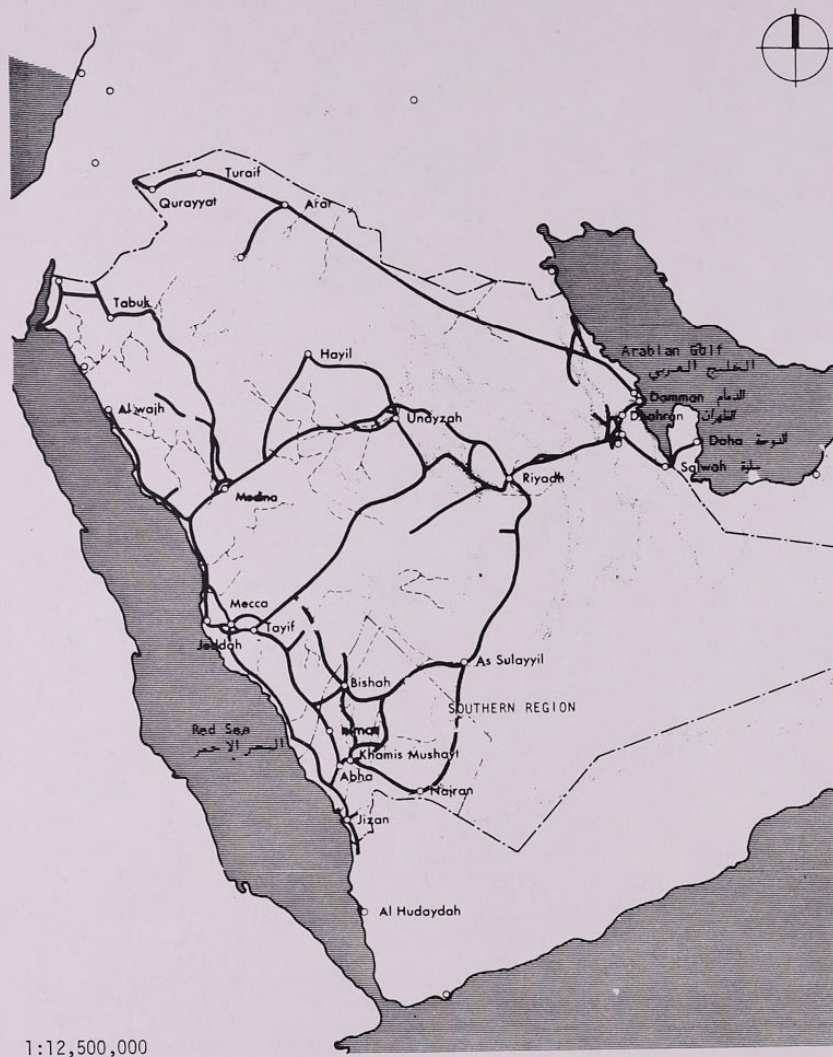


FIGURE 7-1-1  
NATIONAL  
ROAD NETWORK

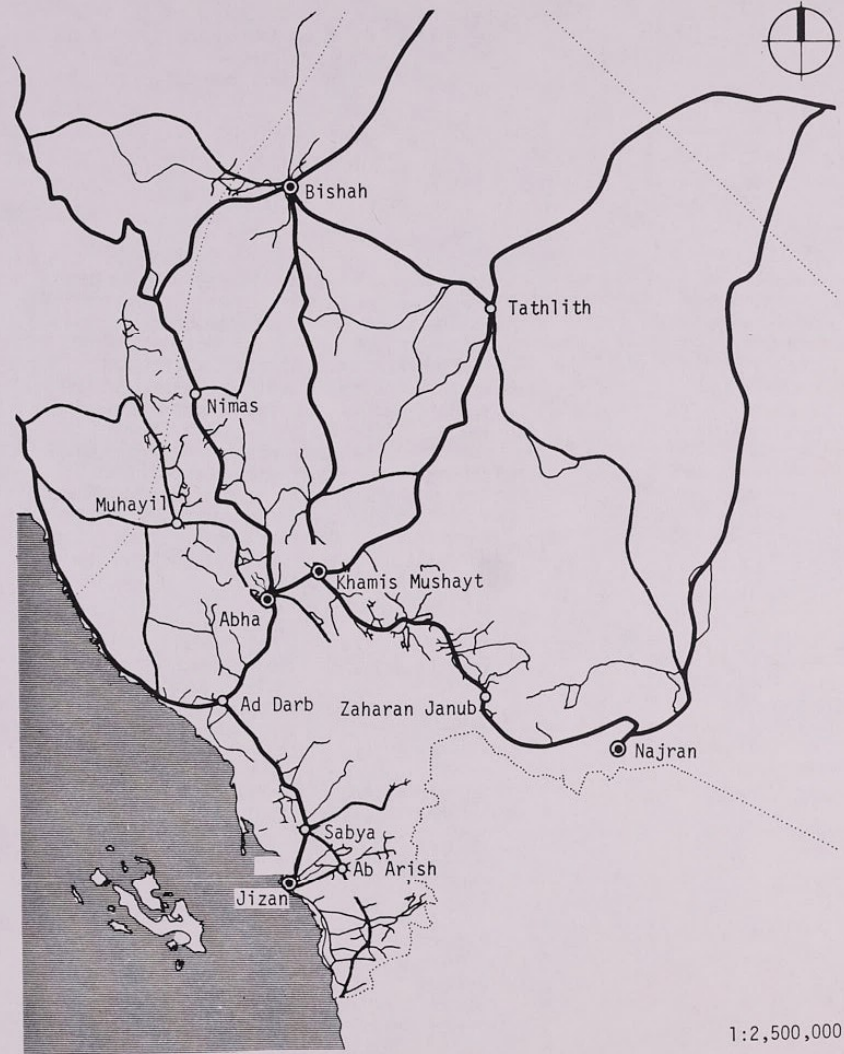


FIGURE 7-1-2  
REGIONAL  
ROAD NETWORK

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such as how many and what type of vehicles were owned or used by them, and for what purposes. Based on the 5% survey, the number and type of vehicles in the city at the time of the survey has been estimated as follows.

Sedans	120
Station Wagons	- 20
Pick-up Trucks	- 20
Jeeps	- 140
Large Trucks	- 40
Total	- 340

B. Manual Traffic Volume Counts. These data are of various types. Straightforward volume counts conducted at locations identified in the Existing Conditions report (Volume II), and subsequent additional counts done to account for traffic patterns established by the recent completion of new roadways (see Tables 7-2-1 (a) and 7-2-1 (b) as well as accompanying figure). Such counts were conducted at strategic locations within the city to determine both basic volume and turning movements of intra-city traffic, and were conducted at all arterial highways leading from the city to determine inter-city traffic movements. On the basis of these manual counts an accurate idea of straight line volume turning movements, intra- and inter-city volumes for the existing situation was determined.

C. Manual Mode Counts. These counts were done independently of the 5% survey, to establish an accurate idea of actual mode use on the roads and to act as a general check of proportional information gathered in the household survey. Table 7-2-2 indicates traffic volume by type or mode as counted at two points (TO 1 TO 2, as identified in the Existing Conditions report, Volume II, Fig. 7-1).

D. Commodity Flow Survey. During field traffic counts, interviews were conducted with drivers to determine commodity flow. This was done primarily to determine such flow between cities since intra-city commodity flow is not considered as important at this level of planning, and to some extent can be indirectly inferred from intra-city origin - destination analysis. Refer to the Southern Region Existing Conditions, Fig. 7-1-3 for a graphic representation of commodity flow between cities of the Southern Region.

E. Origin Destination Survey. Comprehensive origin-destination surveys were conducted by traffic engineering consultants to determine both locational and purpose parameters for trips. To show a complete set of locational origin-destination elements here would be overly complicated for the general level of this report. However, in Jizan, the city was divided into 9 districts for planning purposes. Population, traffic generators and traffic routes were determined within and between these districts so that desire lines for 1995 traffic could be established. A percentage breakdown of trip purpose elements is shown in Table 7-2-3.

The trips were distributed using the gravity method and transportation planning techniques. This method uses distance as an inverse function of trip volume. Distance is stated in terms of travel time which is raised to exponential power to account for its restraining effect. The model can be stated as follows:

$$T_{ij} = \frac{T_i S_j / D_{ij}^n}{(S_x / D_{ix}^n)}$$

Where  $S_j$  = "attraction" factor at  $j$

$S_x$  = "attraction" factor at any zone  $x$   
 $D_{ij}$  = distance or travel time from  $i$  to  $j$   
 $D_{ix}$  = distance or travel time from  $i$  to any zone  $x$   
 $n$  = friction exponent or restraining influence

The "attraction" factor may be expressed in any meaningful way. For example, the logical measure of attraction for work trips would be the number of jobs in the zone.

When the number of trips between pairs of zones have been calculated they were assigned to routes of the appropriate transportation network using minimum friction path method. Resistance to travel was measured in units of time.

A computer evaluation based on iterative procedures was conducted with certain established parameters held constant. Based upon this iterative computer program, the traffic volume assignment was made (see Fig. 7-2-1). For Jizan (and other cities in this study) existing land use and future land use based upon this plan were known. Vehicle occupancy and type were determined by traffic field surveys, and future occupancy and composition were assumed based on established trends and conventional guidelines. From these

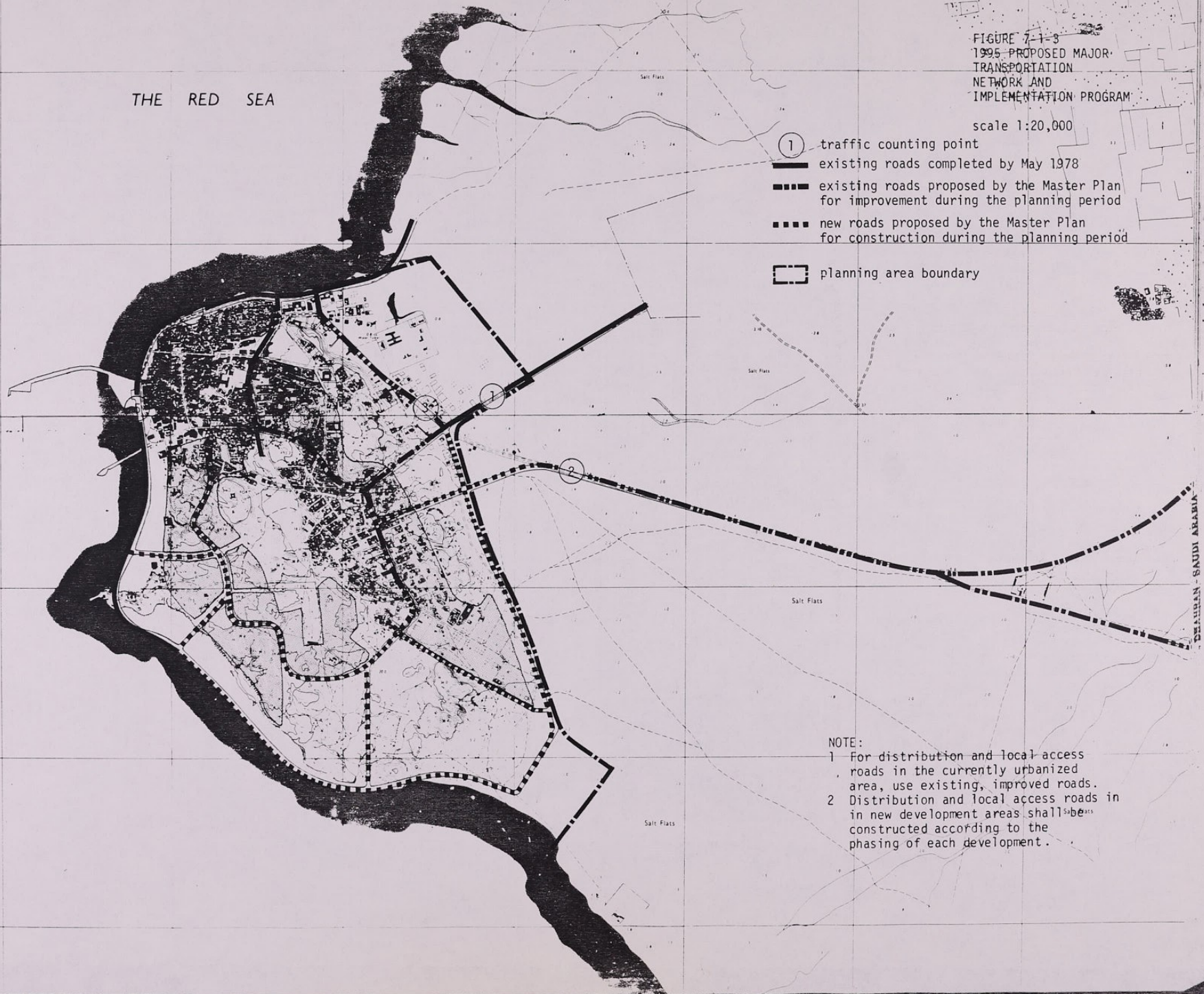


THE RED SEA

FIGURE 7-1-3  
1995 PROPOSED MAJOR  
TRANSPORTATION  
NETWORK AND  
IMPLEMENTATION PROGRAM

scale 1:20,000

- ① traffic counting point
- existing roads completed by May 1978
- existing roads proposed by the Master Plan for improvement during the planning period
- new roads proposed by the Master Plan for construction during the planning period
- planning area boundary



NOTE:  
1 For distribution and local access roads in the currently urbanized area, use existing, improved roads.  
2 Distribution and local access roads in new development areas shall be constructed according to the phasing of each development.

Table 7-2-1 (a)  
UPDATED HOURLY TRAFFIC COUNTS FOR JIZANA<sup>a</sup>

Time Period	Counting Points					
	1	2	3	4	7	6
8 - 9 AM	198	653	1,021	279	321	535
9 - 10	207	728	1,016	350	326	690
10 - 11	206	656	1,076	344	271	722
11 - 12	209	618	1,054	293	268	629
12 - 1 PM	217	553	880	203	213	452
1 - 2	199	430	696	183	200	395
2 - 3	167	480	645	161	116	293
3 - 4	128	417	552	150	86	305
4 - 5	155	381	611	176	130	362
5 - 6	180	379	723	273	139	410

Notes:

a. From a count conducted on June 22, 1977

Table 7-2-1 (b)  
CALCULATED MAXIMUM 24 HOUR VOLUME IN JIZANA<sup>a</sup>

Counting Points <sup>b</sup>	Number
1	1,736
2	5,824
3	8,608
4	2,800
5	5,608
6	5,776

Notes:

a. Commonly accepted assumptions used in calculating these figures are:

1. The maximum hourly volume equals 25% of the average daily traffic.
  2. The maximum daily volume equals 200% of the average daily traffic [1].
- So, the equation for calculating the maximum 24 hour volume at any given point becomes:

$$(4)(a)(2) = 8(a) = \text{Maximum 24 hour volume, where (a) is the maximum hourly volume at a given point.}$$

For example, at counting point number 1 the maximum hourly volume occurred between 12 noon and 1 PM and was 217 vehicles, so the maximum 24 hour volume becomes:

$$4(217)(2) = 1,736 \text{ as shown in the Table above.}$$

b. The counting points are the same as those in Table 7-2-1 (a), as shown in the accompanying figure.

Table 7-2-2  
TRAFFIC VOLUME BY TYPE (MODE)  
(VEHICLE/WEEK)

		Motor cycle	Sedan	Wagon	Taxi	Jeep	Bus	Pick up	Truck	Military	Total
TO 1	from	1,585	663	216	1,225	1,132	23	1,476	858	121	7,299
	to	1,659	513	205	1,255	1,103	28	1,545	849	146	7,303
TO 2	from	292	237	91	369	572	47	527	337	67	2,539
	to	284	231	64	283	617	10	594	308	74	2,474
Total	from	1,877	900	307	1,594	1,704	70	2,003	1,195	188	9,838
	to	1,943	744	269	1,538	1,720	47	2,139	1,157	220	9,777
G. Total		3,820	1,644	576	3,132	3,424	117	4,142	2,352	408	19,615

SOURCE: URTEC Traffic Survey, 1975.

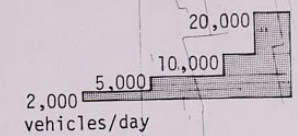
Table 7-2-3  
ORIGIN DESTINATION COMPOSITION BY PURPOSE (PROPORTIONAL)


	Going to Work	Business	Shopping	Recreation	Home	Receiving and unloading	Delivery and unloading	Others	Total
Origin	0.258	0.093	0.085	0.068	0.222	0.085	0.092	0.096	1.000
Destination	0.238	0.226	0.153	0.019	0.102	0.119	0.093	0.051	1.000
Total	0.247	0.166	0.123	0.041	0.156	0.104	0.092	0.071	1.000

SOURCE: URTEC O.D. Survey, 1974, 1975



FIGURE 7-2-1  
1995 PROPOSED  
TRAFFIC VOLUMES  
Scale 1:20,000



 planning area boundary

NOTE:  
Projected traffic volumes are estimated  
on the basis of proposed distribution  
of land uses and proposed road network.  
See text for a description of the methodology  
employed.

THE RED SEA



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data and assumptions, a modal split was established (for conservative planning due to the extreme uncertainty of the rapidly developing situation, the pedestrian mode was purposely excluded here), trips per person and trips per zone were established and consequently person per vehicle. Once the programmatic development of a satisfactory figure for trips per person was achieved, this number was held constant and applied to all future years ( standard procedure). From this information and the planned road network, a modal split assignment was made, road capacities determined and road widths were established. For further information regarding existing traffic and the initial traffic surveys, refer to the Existing Conditions report, Chap. 7. Much additional information on existing conditions of traffic is included in Chap. 5 of the Initial

Appraisal report, including:

1. Road Hierarchy
2. Road Width
3. Road Section
4. Road Inclination
5. Traffic Volume and Capacity
6. Traffic Generation
7. Daily Traffic Flow Variation
8. Parking Space
9. Sidewalk Network
10. Distance From the Center
11. Time From the Center
12. Land and Road System
13. Land Road Width
14. Land and Traffic Capacity

7-2-4 LAND  
USE/TRANSPORTATION  
STUDY ---SUMMARY OF  
CHANGING DEMANDS

A primary objective is to ensure high standards in the developing areas throughout the City of Jizan in the course of creating an efficient transportation system. A policy therefore is founded on three important considerations:

1. To establish an integrated land/use transportation plan.
2. To establish an attractive public transportation system.
3. To establish an efficient commodity distribution network.

As the only major port city in the Southern Region, Jizan as a whole can be considered a main traffic generator. Specifically however a major generator for the city is to be located near the northeast entrance to Jizan where governmental and administrative offices are to be relocated. Located at the southern tip of the city within easy access to the port facilities are the important Petrochemical Industrial facilities. In the northwestern sector of the city, adjacent to the existing port facilities, warehousing and general

industry will be the main activity. Finally, of prime importance as a traffic generator, is Jizan Jizan's airport located just outside the city to the northeast. This airport will serve the entire lower Tihama Range including Sabya and Ab arish, two urban areas of significant size.

Table 7-2-4  
SUMMARY OF TRANSPORTATION DATA

Planning Parameters	1975 Survey	1995 Projected Old City	1995 Projected Total
Planning Population	22,160	8,000	41,000
Jobs	4,380	2,224	11,400
Households	3,420	1,667	8.540
Vehicle Ownership (per thousand persons)	62.1	217.4	217.4

7-2-5 LOCATION AND DESCRIPTION OF GENERATORS

As previously mentioned above an important node of attractivity is the governmental and administration center situated at the eastern entrance to the city. It will employ several thousand workers and cover a sizable area. Not previously mentioned, but of almost equal significance is the regional service and shopping center and the community park and center located to the west of the center of the city. These activity centers will serve the residential zones of the city of Jizan. Several thousand commercial workers will be employed here.

The northwestern sector of Jizan, presently the center of city activity, will be dedicated to warehousing and industrial activities employing another several thousand employees, including some 1300 fishing-related workers.

The petrochemical industrial facilities and the Petromin Reservoir will be conveniently located at the southern tip of the city with easy access to the port facilities and to the rest of the region as well.

The location and the significance of Jizan's airport has already been noted above. Combined with the city's port facilities, the important role played by the airport and Jizan, as a whole, in the overall development of the Southern Region can not

be overstated. An estimated 745,000 passengers can be expected to enplane and deplane by 1995.

In general, the double ring type configuration of Jizan's road network provides an excellent link between all of the major generators in the city. Considering the physical and geological constraints responsible for the extensive redevelopment of Jizan, the proposed network is probably the best choice providing the most efficient traffic circulation. The outer ring road will act as a regional service road for connections to the port, warehouses, industries and petroleum storage areas and to the salt mine by connector roads. The inner ring road on the other hand will serve the residential areas and community facilities, thus shielding them from the potentially conflicting traffic of the heavier uses served by the outer ring road.

#### 7-2-6 PORT FACILITIES

Of all the factors involved in the daily function of Jizan, as well as the entire Southern Region, the port facilities located in the northwest corner of the city are perhaps the most important, if not essential. Inter-regional and intra-regional commodity exchange for the Southern Region is almost entirely dependent on Jizan's imports, Bishah being the only city in the Region not overwhelmingly affected by this dependency. Recent completion of a port expansion program has increased handling capacity and, consequently, the total volume of cargo handled. However, with today's ever-increasing needs and, most importantly, ever-enlarging ships, further expansion of the port facilities can easily be justified and will undoubtedly be needed. Further, the wise relocation of the present city center to the western sector of city and the redevelopment of this same area into a warehousing district, providing storage adjacent to the berths, is sure to increase demand for use of the port facilities quite substantially.

As previously mentioned, the existence of the Farasan Islands just offshore presents an additional potential for the Port of Jizan in the form of tourism. If possible, these islands could be developed as an attractive maritime recreational center, thereby providing an added economic and social benefit to the city and the Region.

As a traffic generator, the port will attract an appreciable volume of heavy commercial truck traffic. For this reason, ample roadway widths and proper traffic control in and around the port facilities is necessary to assure smooth operation.

The economic potential provided by the Port of Jizan has yet to be fully developed. Until then, a program of constant change and expansion will be needed to improve the port facilities and, presumably in the not too distant future, Jizan can begin the exportation of Saudi Arabian goods and commodities.

7-3 PRINCIPAL ROAD NETWORK

7-3-1 ROADWAY CLASSIFICATIONS AND DESIGN CRITERIA

Achievement of good traffic flow continuity depends upon the proper integration of urban and rural roadway networks throughout the vicinity of Jizan and the country.

The urban roadway network for the city of Jizan will maintain the principle classification categories already described in the Regional Master Plan, namely primary, secondary and local roadways. However, the functional classifications of the urban system for the villages can be defined as major and minor arterials, collector roads and local or access roads.

7-3-2 PRIMARY ROAD SYSTEM (V1, V2)

The primary road system will consist of major arterials designed for fairly high speeds with controlled access wherever possible and maximum travel comfort. Provided no major land use constraints exist along the major arterials, a wide right-of-way should be maintained. This wide right-of-way can be utilized to accommodate possible additional traffic or transit lanes in the future. Design speeds should be established at 80 km/hour maximum in urban areas, increasing to 120 km/hour outside urban areas. Horizontal and vertical alignments should correspond to these design speeds. The roadway section will be of two or four lanes, with a minimum 3.65 meter lane width. Unlike the primary system described in the Regional Plan, the urban primary system will consist mainly of signalized or unsignalized intersections depending on traffic conditions. Grade separations are preferred wherever the physical and economical conditions will allow it.

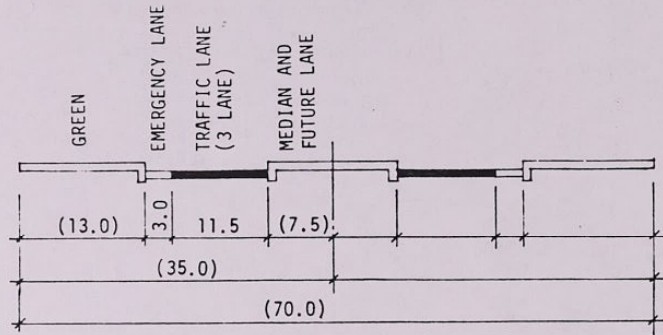
7-3-3 SECONDARY ROAD SYSTEM (V2, V3)

The secondary road system consists of major arterials and minor arterials designed for lower volumes and equal or lower speeds than the primary system. These minor arterials should be designed to accommodate the traffic coming into the city from many surrounding agricultural villages. Secondary road system will require less right-of-way; enough to accommodate necessary traffic lanes, shoulders and a minimum buffer to protect sensitive areas from air and noise pollution. Horizontal and vertical alignments should correspond to a maximum design speed of 100 km/hour in rural areas and 80 km/hour in urban areas. Intersections will be signalized or unsignalized depending on traffic conditions.

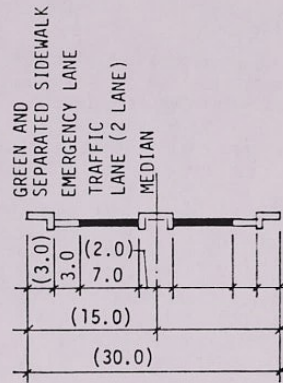
7-3-4 LOCAL ROAD SYSTEM (V4, V5, V6, V7)

The local road system consists of mostly local collector and access roads. These local collectors will require minimum right-of-way to allow maximum land utilization. The low design speeds of 60 km/hour maximum is suggested to be compatible with pedestrian traffic and other urban activities.

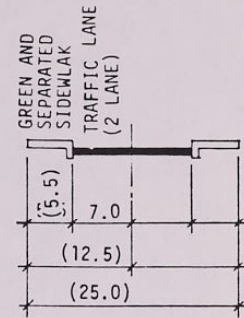
V<sub>1</sub> EXAMPLE  
(REGIONAL HIGHWAY)  
6 LANE



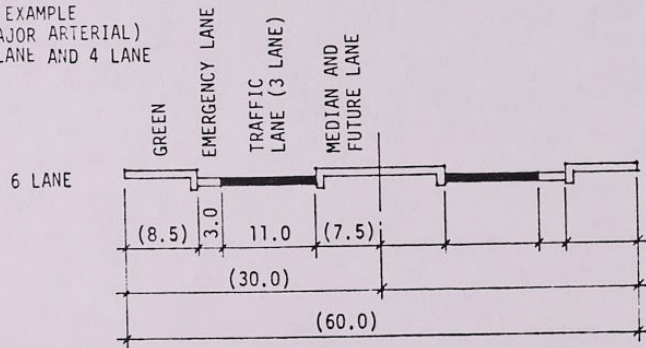
V<sub>3</sub> EXAMPLE  
(ARTERIAL)  
4 LANE



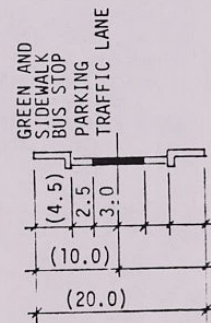
V<sub>4</sub> EXAMPLE  
(COLLECTOR)  
4 LANE



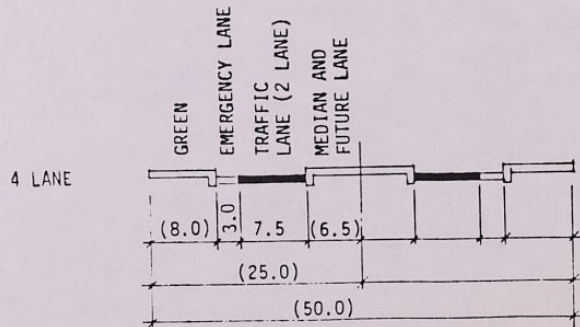
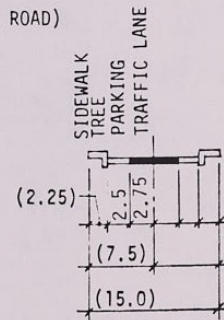
V<sub>2</sub> EXAMPLE  
(MAJOR ARTERIAL)  
6 LANE AND 4 LANE



V<sub>5</sub> EXAMPLE  
(DISTRIBUTOR)  
2 LANE



V<sub>6</sub> EXAMPLE  
(LOCAL ACCESS ROAD)  
2 LANE



NOTE: ( ) Dimensions can vary depending on the local condition and detail design, sometimes median strip and green zone can even be eliminated where elimination is justified by the detail planning.

FIGURE 7-3-1  
ROAD SECTIONS BY  
CLASSIFICATION  
(EXAMPLE)

#### 7-4 PUBLIC TRANSPORTATION

##### 7-4-1 URBAN BUS TRANSIT SYSTEM

Because of the configuration of commercial, industrial, administrative and residential sectors, demand for an extensive mass transportation network for Jizan is high. This will be especially true when the new city relocation takes place. The high concentration of activities around the regional/community civic centers and the governmental/administrative buildings, as well as the expected but unpredictable future growth of the country and the region, obviously warrants the establishment of an efficient urban bus transit system. Success of attracting potential users depends on a combination of important factors; the size of bus, riding comfort, operating schedules, station locations and transfer points and terminal locations.

##### 7-4-2 SYSTEM LOCATION

The principal center of the system should be located near the administrative zone at the east entrance to the city. However, the more precise location of the terminal should be established after a more detailed study is conducted to enhance and improve people and commodity movement and to provide the fluent access to and from the regional highway to Abha. Integration of this system with the intra-regional long haul bus system is imperative. Specific locations of stations and transfer points must be strategically placed to serve the public's needs for maximum efficiency.

Because of the close proximity of the residential areas to the main city activities, a more localized or "courtesy bus" type transit system should be considered. This system, serving specific residential, civic and commercial areas on a regularly scheduled basis, would reduce the number of vehicular shopping trips made to the city center and consequently also reduces demand for parking.

##### 7-4-3 OTHER MODES

Due to the size and configuration of Jizan, a more sophisticated mode of public transit such as a rapid transit system would not normally be warranted until well beyond the 20 year planning period. However, because of the anticipated development of the new relocated city, some form of public transport will undoubtedly become necessary. Therefore, provision for a "public transit corridor" within the highway right of way should be planned along the route to the new city wherever that might be. Implementation of such a transit system should be timed to coincide with the completion of the first substantial phase of the development of the new city.

##### 7-5 TRAFFIC CONTROL POLICY

##### 7-5-1 ROADWAY HIERARCHY

Achievement of the fundamental transportation planning and environmental management objectives set forth in the Master Plan necessitates, among other things, the establishment of a clearly defined hierarchy of roads; the strict control of important design parameters and the establishment of a well planned training program directed to extending and maintaining the transportation systems. Satisfying these goals will ultimately encourage drivers to make their journeys along the most appropriate roads.

The hierarchy of the road network has been defined previously. Control of certain design parameters is established below.






##### 7-5-2 PRIMARY AND SECONDARY SYSTEM

At present the primary arterial for Jizan enters the city from the east and runs westerly to the coast road dividing the city in two. Several hundred meters to the north, a second major arterial parallels the first connecting the coastal area directly with the airport. These two major arterials along with the outer ring road will carry the major load. The outer ring road will be quite useful in accommodating the expected heavy truck traffic generated by the petrochemical plant, warehousing areas, industrial areas and port facilities.

The secondary system will consist of the inner ring road connecting the residential and community functions of the city.

FIGURE 7-5-1  
1995 PROPOSED ROADWAY  
NETWORK CLASSIFICATION

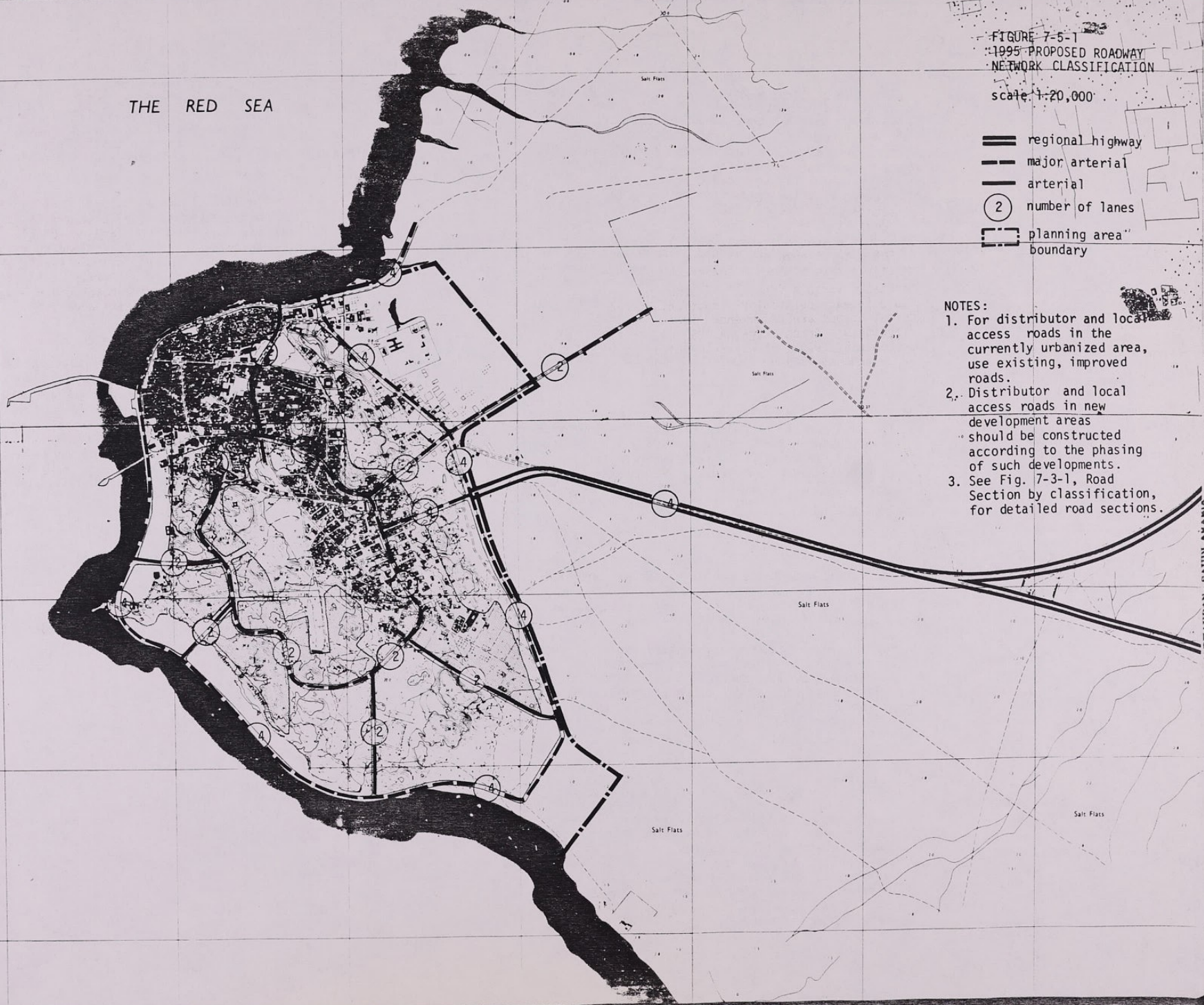
scale: 1:20,000

-  regional highway
-  major arterial
-  arterial
-  2 number of lanes
-  planning area boundary

- NOTES:
1. For distributor and local access roads in the currently urbanized area, use existing, improved roads.
  2. Distributor and local access roads in new development areas should be constructed according to the phasing of such developments.
  3. See Fig. 7-3-1, Road Section by classification, for detailed road sections.



THE RED SEA



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DRAINAGE - SAUDI ARABIA

This basic network configuration should provide adequate vehicular circulation around the activity centers, provided the environmental, parking and pedestrian policies are enforced. Access to frontage properties and parking on or along these arterials should be restricted or prohibited respectively. In high volume areas, such as the activity centers already discussed, certain vehicles such as motorcycles, donkey carts, etc. should be prohibited.

Interchange spacings should be held to a minimum of 500 meters where possible and the laying of utility services beneath the roadway should be prohibited. Various types of interchanges are possible in each particular situation, however certain types are recommended in the Appendix, Planning Standards, Figs. A-2-9 (c) and A-2-9 (d). In general a right of way reservation of 70 meters is recommended.

#### 7-5-3 COLLECTORS

The function of the collector roads is to provide a link between the primary roads and the local residential, industrial, business, agricultural and commercial areas. As redevelopment takes place, an increasing degree of restrictions should be placed on frontage access and street parking where warranted.

Secondary and minor collectors connect the residential areas with the secondary arterials and ultimately with the activity centers. These roads should facilitate the safe and free movement of traffic within the districts they serve.

For these collector roads, junction spacings should be at a minimum of 200 meters where possible. The junctions should be controlled by the traffic signals or signs depending on traffic conditions and utilities should not be placed beneath the roadway, but adjacent to right-of-way.

#### 7-5-4 LOCAL AND ACCESS ROADS

These roads will provide a link between smaller access roads and the collector system. By design these roads should attract only local traffic for immediate access to residences, shops or offices and should discourage through traffic. Appropriate restrictions should be set with regard to access and street parking to meet particular needs. Utility services should be located in casements adjacent to the travel way.

#### 7-5-5 GRADE SEPARATED CROSSINGS

Grade separated interchanges not only increase capacity and safety, but reduce congestion, shorten travel time and efficiently transfer traffic from one roadway to another. Grade separated crossings separate traffic from two roadways but do not allow interchange of traffic between these roadways.

In Jizan it is felt that in order to create both a functional and symbolic separation of the salt mine and the community and residential areas surrounding it, the two roads leading to the salt mine from the outer ring road serving industry and the port should pass without interchange beneath the inner ring road serving community functions and residential areas.

#### 7-5-6 SAFETY CONSIDERATIONS

To ensure the safe and efficient use of the proposed road system, careful consideration must be given to specific design parameters such as turning movements, visibility requirements and pedestrian movements for each roadway type. Restricting the number of junctions along major roads will increase safety by decreasing possible vehicles and pedestrian signals is an effective method of traffic control and is strongly recommended.

Mandatory speed limits, strictly enforced by traffic police, is by far the most effective means of safety control.

Perhaps the most important factor in the planning of a safe efficient and environmentally compatible transportation system is the establishment of an adequate training program for the maintenance and operation of the existing or planned transportation systems.



## 7-5-7 PEDESTRIAN MOVEMENT

The use of pedestrian crossings, both signalized and unsignalized, or grade separation crossings are essential in the segregation of pedestrian and vehicular activities. Restriction of vehicle penetration within the central area, or "pedestrianization" of main shopping streets, not only increases safety but improves the environment as well.

It would be quite impractical to recommend the precise locations of pedestrian crossings that may be needed in the future. The selection of such locations should be based on up-to-date surveys of pedestrian movements within the city and detailed studies of short term developments which might make alternative crossing points more attractive. Pedestrian routes which cross primary roads must be given careful attention, and the construction of pedestrian bridges or subways must be given detailed consideration.

## 7-6 CAR PARKING POLICY

### 7-6-1 GENERAL

Increased prosperity will increase vehicle ownership quite substantially by 1995, resulting in increased pressures to control the use of road space and increased conflicts between moving and stationary vehicles. Concentration of commercial and business activities in the city centers will, consequently, be of major concern. Therefore, the main car parking policy for Jizan must attempt to provide a reasonable balance between the capacities of the car parks and the road system planned for the central area.

### 7-6-2 PARKING DEMANDS

To accommodate the dominant types of trips made by vehicle users, two categories of parking demands exist, namely long and short term parking. Long term parking is attributed to workers employed in the City Center. These long term facilities can be located on peripheral sites providing reasonable access to the work center with walking distances less than 400 or 500 meters. Short term parking attributed to shopping and business trips comprises the major portion of the parking space demands. This trend can be expected to continue indicating that priority should be given to accommodating these demands conveniently within or close to the central business district. General locational policies, however, for both types of facility demands must consider specific proposals for access from the primary feeder road system and, most importantly, the competing demands for land in the central business area, which may highlight the advantages of multi-story car parks.

Additional general policies for parking planning, design and location are as follows:

1. Off street parking should be encouraged wherever possible, especially at busy intersections.
2. All parking facilities, whether on-grade or multi-story, should have painted parking stall lines. See Fig. A-2-9 (f) for appropriate dimensioning for such stalls.
3. On-grade parking facilities should utilize landscaped islands to subdivide large paved areas.
4. Whenever large scale development of any kind is planned (such as a civic center, central sq, etc.) parking should be included as an integral part.
5. Public parking areas should be created at all main commercial centers. These should be off-street facilities, planned in such a way as to avoid congestion at street intersections.
6. Where possible and economically feasible, multi-level parking structures should be used. See the Appendix, Planning Standards, Fig. A-2-9 (e) for examples of multi-level parking structures.
7. Although each parking facility, whether independent or associated with a major development, should be individually examined and planned according to the specific needs of each development, the following guidelines may be used for an initial determination of number of parking spaces.
  - A. Housing - 1 space per household
  - B. Office - 1 space per 30 m<sup>2</sup> floor area
  - C. Commercial - 1-4 spaces per 40 m<sup>2</sup> sales area (see the planning standards section A-2-6 for more detail).
  - D. Industrial - 1 space per 5 employees
  - E. Hotel - 1 space per guest room
  - F. Entertainment - 1 space per 10 seats
  - G. Hospital - 1 space per bed

Specific parking data for Jizan reveals two important characteristics: first, continuous parking for greater than two hours is rare (this fact is common to most of the region); second, a relatively low percentage of parking for the purpose of business (3.9%) and an unusually high percentage of parking for shopping purposes (33.5%). Again, the immediate demand to be satisfied is that for short term parkers.

The governmental/administrative zone, previously discussed, can be expected to generate nearly 55,000 personal trips or approximately 23,000 to 25,000 vehicular trips. The Regional and Commu-

ity Centers located in the western section can be expected to generate over 23,000 personal trips or about 8,000 to 10,000 private vehicles. Near the port facilities, over 27,000 personal or about 10,000 to 13,000 vehicular trips will be generated. In addition to these demands, heavy commercial truck traffic must be anticipated not only around the port facilities, but near the petrochemical plant and the airport as well. Because of the network configuration, excessively heavy commercial truck traffic can be avoided in the central city area by restricting truck traffic to light pick-up and delivery vehicles only. Heavy truck traffic, utilizing the port facilities, should be assigned to the outer "ring" route only.

#### 7-6-3 VEHICULAR PENETRATION

Another consideration in the establishment of a good car parking policy is vehicular penetration within the Commercial Center. A policy restricting vehicular traffic to commercial vehicles delivering goods and private vehicles associated with families residing in the center would provide a safe environment for shopping and business activities.

Where commercial areas exist directly along major roads, vehicular penetration and access should be established to reduce possible congestion. Parking should be provided at the rear of such commercial areas, and community access should be from this side as well. Frontage parking should be limited and strictly controlled. Loading and unloading should not occur directly from the street, but at loading areas at the sides or back of commercial establishments. Such frontage control is especially important at major intersections where undesirable congestion would otherwise certainly occur.

#### 7-7 ENVIRONMENTAL MANAGEMENT POLICY

##### 7-7-1 THE FACTORS AND IMPACTS

Design of any transportation links or terminals should be done concurrently with environmental impact assessments to minimize adverse consequences to surrounding areas. In addition to the usual factors taken into consideration such as right-of-way acquisition, type of construction and traffic volumes it is necessary to evaluate the impact on air quality, noise levels and aesthetics of the facility.

Since noise and air quality are the most critical items in an environmental assessment, an effective Environmental Policy and National Standards must be established and enforced. As an example, the United States Environmental Standards are shown below.

After these standards are established, design parameters such as number of lanes, median widths, shoulder widths, maximum grades and roadway curvatures and design speed limits should be reviewed and modified if necessary. Governmental and administrative policies can be set as to the allowable automobile pollutant emissions to be accepted. Land use or urban activity must be controlled in the vicinity of any transportation facility.

##### 7-7-2 METHODS AND CONTROL

The City of Jizan is presently fortunate to have a clear, clean and quiet environment. It will be the responsibility of the Administrators and Planners not to permit conditions to deteriorate, but to improve them instead.

In populated areas along the primary system, vegetative, earth or man-made barriers can be used aesthetically to control objectionable noises produced by traffic. Many materials and techniques are available for the construction of these noise barriers and at a relatively low cost. The right-of-way at intersections where congestion tends to build up should be ample in size and access should be partially or fully controlled to provide a separation between traffic flow and surrounding developments which could result in reduction of noise and air pollution.

Grade separated interchanges not only increases capacity and safety, but reduces congestion, shortens travel time and efficiently transfers traffic from one roadway to another. If port activities increase as anticipated, heavy commercial truck traffic will reduce capacities on the network and thus warrant grade separation, for example at the junction of the "ring" route and the main inter-regional highway from Abha. However, present data does not seem to warrant grade separated interchanges except to separate the saltmine access routes from the inner ring road.

Aesthetics should always be kept in mind when choosing the final design of grade separations, roadway intersections or traffic control devices in general. Landscaping and provision of wide open right-of-ways contribute greatly to safe and comfortable transportation.

7-7-3 POLICY SUMMARY

Therefore, the environmental management policy must extend to the design of various interacting facilities other than just the road types and their junctions. Careful consideration must also go into the location and design of car parking areas, pedestrian routes, general traffic control devices and most importantly an attractive public transportation system with adequate terminal and transfer facilities.

7-8 PHASING AND COST OF RECOMMENDED IMPROVEMENTS - INVESTMENT NEEDS FOR 5, 10 AND 20 YEARS

Recommended construction of the road network must be related to the growth estimates prepared for the village cluster. In order to ensure adequate widths of right-of-ways for future transportation corridors, it recommended that right-of-ways be established and purchased as soon as possible.

The early purchase of right-of-ways will minimize costs and also will establish minimum building setbacks for future developments.

It is estimated that approximately 1 km of a six-lane, 9 km of a four-lane roadway and 11 km of a two-lane roadway have to be built by the year 1995 to establish a basic road network. The total construction cost of the proposed improvements is estimated to be 22.2 millions S.R. Since the bulk of this construction should be completed in the first 10 years, it is recommended that 33% or 7.4 million S.R. be expended in the first 5 years, another 33% in the next 5 years, and the remaining 33% in the final 20 years of the planning period.

All costs cited are estimated in order of magnitude costs based on hypothetical road alignments and an average cost per kilometer based on 1977 costs, excluding cost of right-of-way.

Table 7-7-1  
UNITED STATES FEDERAL EXHAUST EMISSION  
STANDARDS AND CONTROL LEVELS

Type of Vehicle	Emissions Expressed in Grams Per Kilometer		
	HC	CO	NO <sub>x</sub>
Light-duty Gasoline Passenger Car	0.94	9.4	1.25
Light-duty Diesel Passenger Car	0.94	9.4	1.25
Light-duty Gasoline Truck	1.25	12.5	1.9
Light-duty Diesel Truck	1.25	12.5	1.9



8. public utilities

8-1 ELECTRICITY

8-1-1 EXISTING AND PLANNED SERVICES

Jizan's power station is located in the central part of the city. This power station has been recently built as a substitute for the old one. The new power station contains five generators. Three of these generators have a capacity of 400 kw each, and two have a generating capacity of 500 kw each. Therefore, Jizan's present generating capacity is 2,400 kw.

The city's new line network is gradually replacing the old line network.

According to the electricity project in the Jizan area, the electricity supply network of Jizan will be connected with the network of Sabya and Abu Arish, which is currently under construction. Indeed, the Jizan area electricity project calls for the surrounding villages of these three cities to be connected by this Region-wide network. In the end, this network will be connected to the Asir electricity network, and to Biljurishi, forming the nation-wide power supply network.

8-1-2 ESTIMATED DEMAND BY DISTRICT

Based on the assumption that 300 watts of generating power per person is necessary for residential areas, Table 8-1-1 gives the projected demand for electricity by residential planning districts in 1995.

8-1-3 PROPOSED SERVICES

It is clear that by 1995 Jizan's industrial and commercial facilities will be pretty much developed, and the city will have a great need for substantially more generating capacity. This problem will probably be greatly solved when Jizan's generator is incorporated into the regional and national power network.

Table 8-1-1  
1995 PROJECTED DEMAND FOR PUBLIC UTILITIES SERVICES, EXISTING JIZAN

Planning District	Electricity 0.3 kw/ person	Gas 0.5 kg/day/ person	Fuel 8.3 l/ day/ person	Water 150 l/day person	Refuse 0.5 kg/day/ person	Popu- lation
<b>A. DOMESTIC DEMAND BY DISTRICT</b>						
1.1	1,260 kw	2.1 ton/day	9.7 kl	630 m <sup>3</sup> /day	2.1 ton/day	4,200
1.2	1,140	1.9	8.7	570	1.9	3,800
Total	2,400	4.0	18.4	1,200	4.0	8,000
<b>B. NON-DOMESTIC DEMAND</b>						
All Facilities	1,600	2.4	12.8	300	2.4	8,000
<b>C. CITY TOATL DEMAND</b>						
Total	4,000	6.4	31.2	1,500	6.4	-
	(0.5 kw/ person)	(0.8 kg/ day person)	(3.9 l/ day person)	(188 l/ day person)	(0.8 kg/ day person)	



THE RED SEA

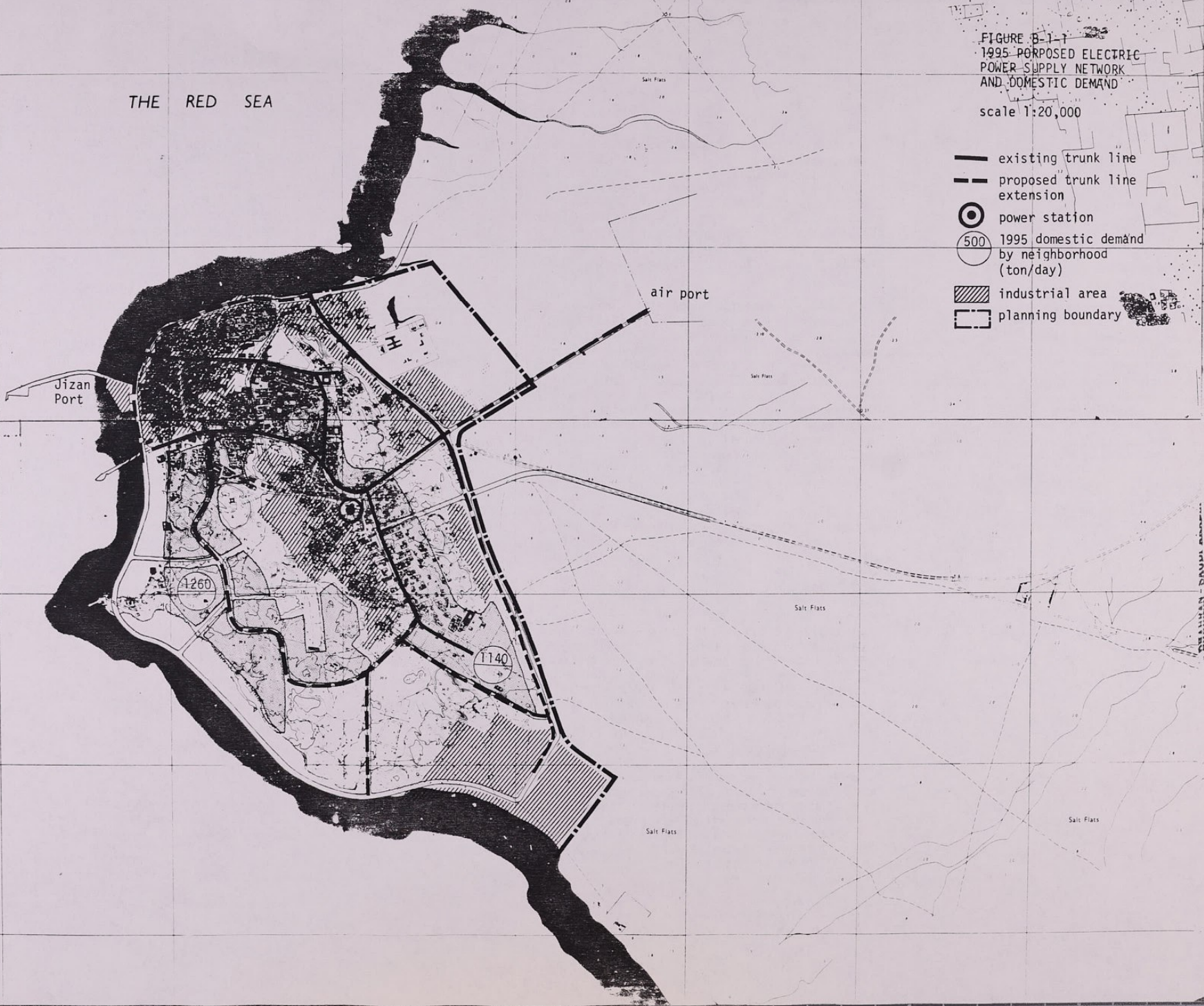


FIGURE B-1-1  
1995 PROPOSED ELECTRIC  
POWER SUPPLY NETWORK  
AND DOMESTIC DEMAND

scale 1:20,000

-  existing trunk line
-  proposed trunk line extension
-  power station
-  1995 domestic demand by neighborhood (ton/day)
-  industrial area
-  planning boundary

Jizan  
Port

air port

1260

1140

Salt Flats

Salt Flats

Salt Flats

DESIGNED BY: DR. H. M. AL-SAYED

## 8-2 WATER

### 8-2-1 WATER RESOURCES

The estimated amount of water which is theoretically available to the Tihama sub-region [1] is 1,055.3 million cubic meters per year (MCM/yr.). Of this amount, 245.1 MCM/yr. is theoretically available to the Wadi Jizan basin, on which the city of Jizan depends for its water supply [2]. Applying the current average consumption rate of 36.7% for the Tihama sub-region, the estimated amount of water actually available in the Wadi Jizan basin is 90.0 MCM/yr.

There are a number of methods for increasing the available supply of water. The construction of the Jizan Dam is an effective way to capture some of the runoff which would otherwise be lost. Other methods include water harvesting with subsurface storage and desalination. The latter method can result in 20 MCM/yr. of additional water to the Wadi Jizan basin. Altogether, it is estimated that the average consumption rate may be increased to 47.6% of the theoretical maximum by moderate investment [3]. For Wadi Jizan basin, this implies an increase of 36.7 MCM/yr. over the current level of consumption.

Since current consumption of water by Jizan is less than 1 MCM/yr., it is apparent that difficulties do not lie in the absolute supply of water in the Wadi Jizan basin, but in transporting the available water to the city across the salt flats.

### 8-2-2 EXISTING AND PLANNED

Because Jizan extends into the sea, it is impossible to obtain potable water from wells. Therefore the city had to develop a piped water supply system long ago. Actually, Jizan's water supply system was established in 1372 A.H. with pipelines connected to the wells in Wadi Jizan far from the city. In 1975 A.D. the number of wells was extended from 2 to 4, and the water network in the city was constructed.

A number of city residents have water pipes connected to their homes. For those who cannot afford to construct their own pipes, the four outdoor running water stations are provided. Anyone can take water freely from these stations. However, there are some people who carry water and to the private houses.

The supply of water in Jizan is estimated to be 1,000 tons per day, equivalent to 0.365 MCM/yr. [4]. The estimated current domestic demand for water is one tone per person per month [5]. With a population of 22,200, this is equivalent to .266 million cubic meters per year.

150 lit/day [6]. Given the 1995 planning population of 8,000, the total domestic demand for water will be 1.2 MCM/yr. Although industrial consumption is difficult to project, it will most likely not exceed 0.3 MCM/yr. [7]. The total demand for water in 1995, therefore, will be 1.5 MCM/yr.

Water rates are exactly the same as Bishah, based on three different grades according to the size of the house using the water. They are:

1. 10 S.R./month - Musalah (large concrete houses)
2. 5 S.R./month - Ordinary block and wood houses; and
3. 3 S.R./month - Hut (small) houses.

By far the biggest problem associated with Jizan's water supply system is that the pipe network causes ground subsidence. Because the line network consists of only small pipes and the soil condition is not hard, these pipes are easily broken and water running out into the soil leads to erosion. Another problem confronting Jizan in its water development plan is that there is no water supply network in the southern section of the city.

In general, it is recommended that studies for a citywide water supply network be commenced and that the existing network be closely examined for possible deterioration and leakage.

### 8-2-3 ESTIMATED DEMAND BY DISTRICT

Based on the assumption that 54 cubic meters of water per person per year are necessary for residential areas, Table 8-1-1 gives the projected demand for water by residential planning districts in 1995.

### 8-2-4 PROPOSED SERVICES

From a planning standpoint, it is assumed that the per capita consumption of domestic water will be 150 lit/day [6]. Given the 1995 planning population of 8,000, the total domestic demand for water will be 1.2 MCM/yr. Although industrial consumption is difficult to project, it will most likely not exceed 0.3 MCM/yr. [7]. The total demand for water in 1995, therefore, will be 1.5 MCM/yr.









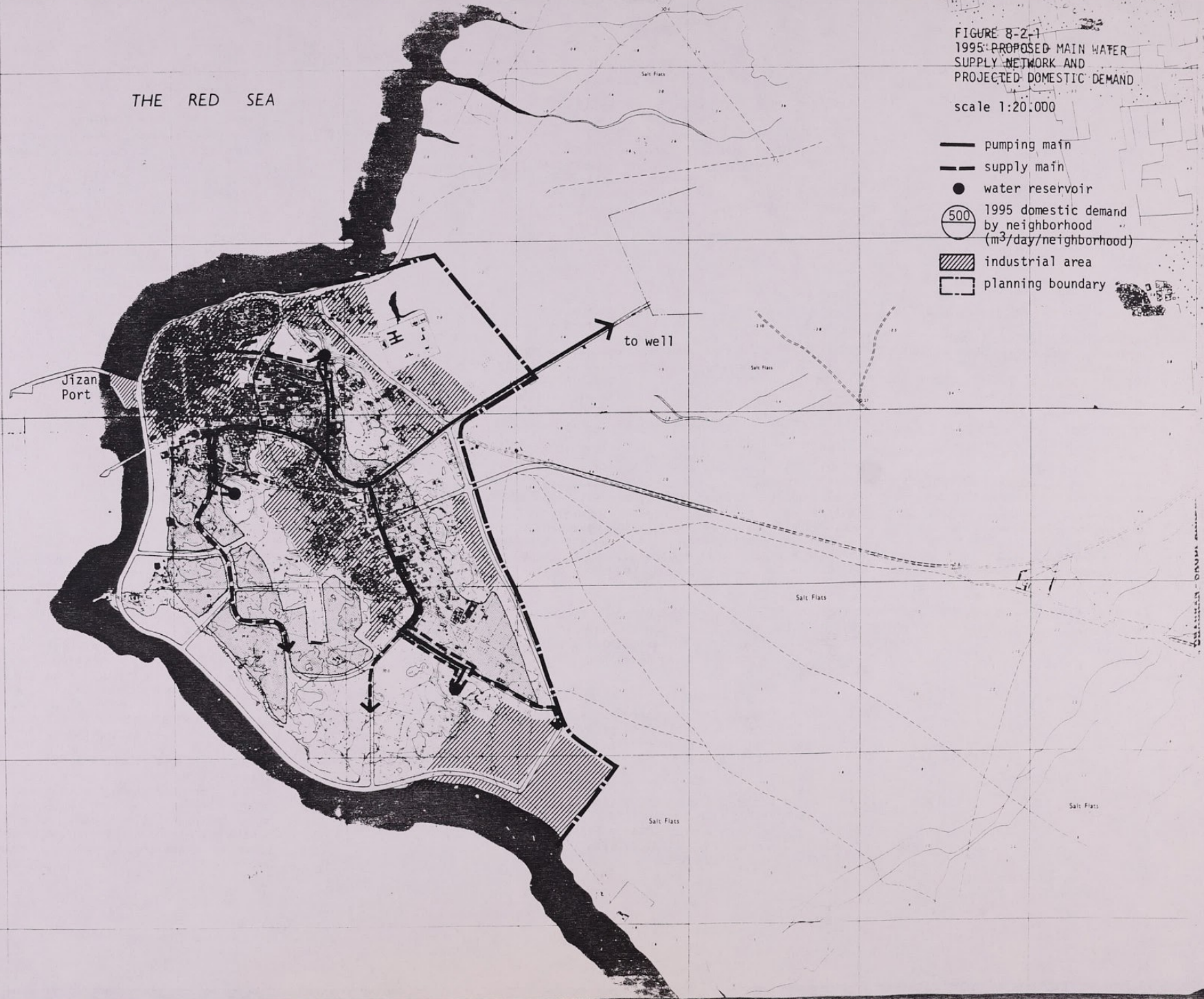


THE RED SEA

FIGURE 8-2-1  
1995 PROPOSED MAIN WATER  
SUPPLY NETWORK AND  
PROJECTED DOMESTIC DEMAND

scale 1:20,000

-  pumping main
-  supply main
-  water reservoir
-  1995 domestic demand by neighborhood (m<sup>3</sup>/day/neighborhood)
-  industrial area
-  planning boundary



In the future, it is necessary for Jizan to revise its water supply system in two ways:

1. existing water pipes must be replaced by heavier and more durable pipes which are more capable of coping with the high metal aggressiveness of Jizan's soil; and
2. the water supply network must be expanded to the southern part of the city to stay in step with the future increase of residential and commercial activity there.

### 8-3 SEWERAGE

#### 8-3-1 EXISTING AND PLANNED SERVICES

The city of Jizan has no sewerage network. Large establishments have concrete cesspools, while domestic buildings discharge into the sea. Although these methods are fairly successful in high areas, in the low, coastal flat areas such as the market, the environmental conditions have seriously deteriorated.

The municipality has a truck and provides disposal service on request. However, because service is limited to approximately 10 trips per day [8], its effectiveness is extremely limited. The absence of an adequate sewage disposal system has resulted in widespread insanitary conditions, posing serious health hazards to the residents, and in structural damage to houses caused by induced subsidence.

For purposes of planning, the projected sewerage requirement may be obtained from the expected water demand. As a first approximation, the dry-weather flow may be assumed to equal the daily water consumption in 1995.

On the whole, the lack of a proper sewage system, particularly after the installation of a water supply system, has severely compromised the quality of urban life in Jizan.

#### 8-3-2 PROPOSED SERVICES

It is recommended as a top priority item that Jizan seriously study the feasibility of alternative sewerage systems, and ultimately implement a sewerage system which is consistent with the city's present and future needs.

### 8-4 STORMWATER DRAINAGE

#### 8-4-1 EXISTING AND PLANNED SERVICES

Currently, Jizan has no drainage network. Stormwater usually flows toward the sea in naturally occurring water courses. In hilly areas, where soil is porous, water is quickly drained or absorbed by the ground. However, in the lower coastal areas, the land is often too flat to allow adequate drainage.

The northern part of the flat coastal area, where a fishing village is located, is subject to periodic flooding. Construction of the new pier has altered the natural water courses, and so the marshy areas also have poor drainage.

#### 8-4-2 PROPOSED SERVICES

In order to avoid flooding, it is recommended that all city streets be paved (or re-paved) in such a way as to be given sufficient slope for a natural drainage of the surface stormwater. The existing report on drainage should be re-examined and updated as necessary for immediate implementation [9].

### 8-5 SOLID REFUSE COLLECTION AND DISPOSAL

#### 8-5-1 EXISTING AND PLANNED SERVICES

Jizan's garbage collection system is based on a system of dust boxes distributed around the city. As of 1975, the garbage collection and disposal system had the following features:

1. There were 88 dust boxes distributed on the streets;
2. There were 13 collecting stations, distributed among districts, from which 3 automatic and 2 manual municipal trucks take the rubbish and carry it to the disposal site, where it is dumped directly on the ground; and
3. the volume of garbage disposal was estimated to be about 10 tons per day.

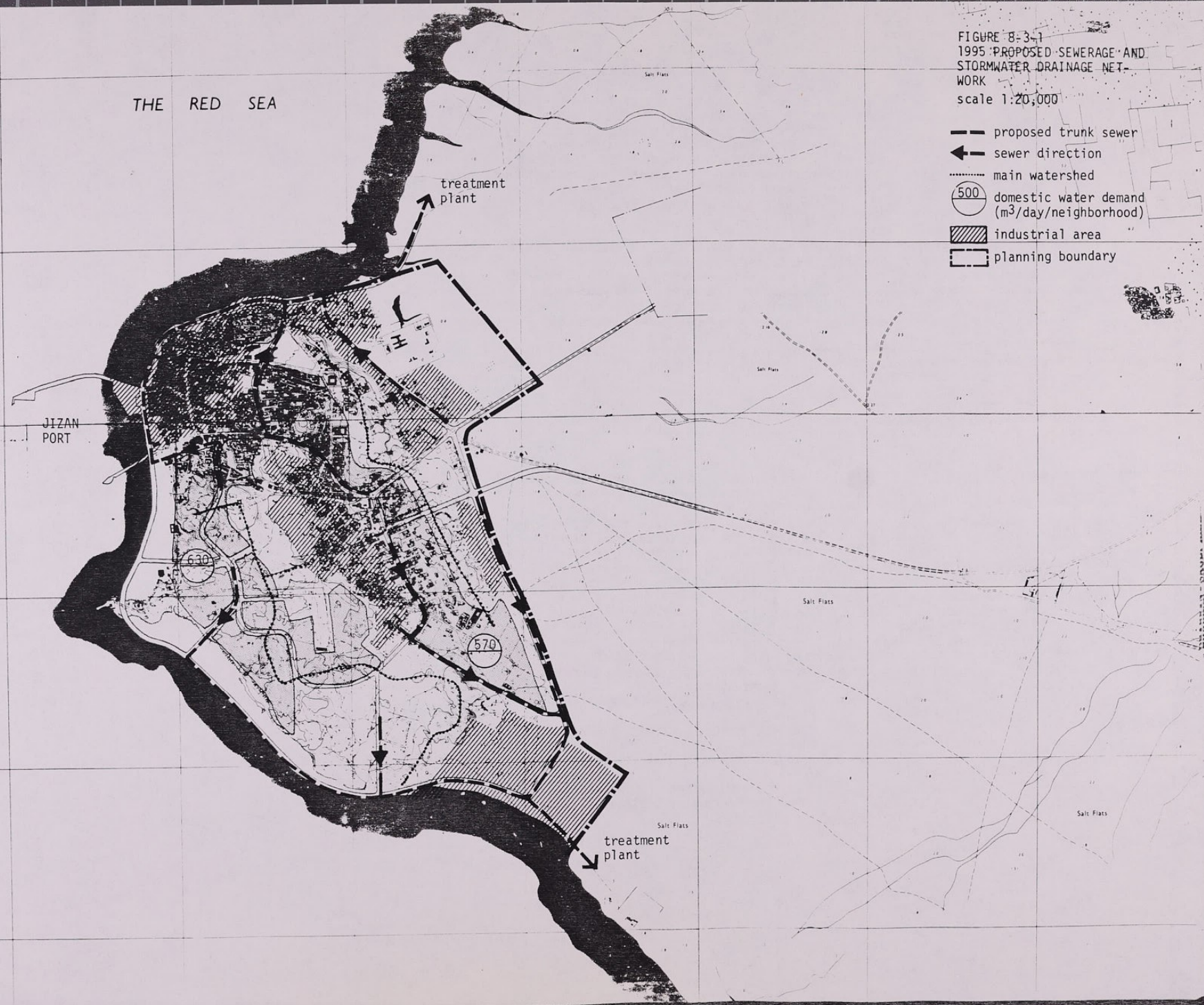
From a practical standpoint, the present system is inadequate to deal with the accumulation of solid refuse. Because there are an insufficient number of dust boxes, or because systematic collection is alien to the existing social customs, residents continue to throw garbage in empty lots or onto streets. Therefore, strict enforcement of prescribed disposal methods is necessary.

FIGURE 8-3-1  
 1995 PROPOSED SEWERAGE AND  
 STORMWATER DRAINAGE NET-  
 WORK  
 scale 1:20,000

- proposed trunk sewer
- ← sewer direction
- ..... main watershed
- 500 domestic water demand (m<sup>3</sup>/day/neighborhood)
- ▨ industrial area
- planning boundary



THE RED SEA



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1995-1996  
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 PROJECT  
 8-3-1

The present site of the dump is too close to the city boundary. The residential development area approved by the Deputy Ministry for Town Planning Affairs is located immediately adjacent to the salt flats. Only a short distance separates the development from the dump. Since the wind in summer occasionally blows from the southeast, odor of decomposition as well as smoke from the burning of garbage will seriously affect the environmental quality of the residential area.

#### 8-5-2 PROPOSED SERVICES

Jizan's garbage collection and disposal system should be altered in three ways:

1. city residents should be completely informed about the consequences of their present disposal methods on the city's environment;
2. the city should have a more comprehensive garbage collection system; and
3. the new dump site should be located further away from the city.

#### CHAPTER 8 NOTES:

1. For definitions of sub-regions, see Southern Region, Preliminary and Final Physical Plan, Sec. 3-1-1.
2. Theoretically available supply of water is the sum of the runoff, aquifer, effective rainfall, and return flow. For calculations, see Southern Region, Preliminary Physical Plan, Tables 4-2-1 (a), 4-2-1 (b), and 4-2-1 (c).
3. Southern REgion, Preliminary Physical Plan, Table 4-3-1.
4. Jizan, Initial Appraisal of Existing Conditions, Sec. 5-2-2.
5. Jizan, Initial Appraisal of Existing Conditions, Sec. 5-2-2.
6. Southern Region, Preliminary Physical Master Plan.
7. Southern Region, Preliminary Physical Master Plan.
8. Jizan, Existing Conditions, Vol. I, Sec. 7-4-2.
9. J.D. and D.M. Watson, Report on Sewage Disposal and Stormwater Drainage in Jizan, August 1969.

9. land use

9-1 EXISTING AND  
PROJECTED LAND USE

9-1-1 EXISTING CONDITIONS

There are 520 ha of land in the city of Jizan, which includes sections of marshy salt flats in the northeast, where a hospital and other structures have been built, and the proposed land fill along the western coast of the promontory. This constitutes the total amount of buildable land in Jizan. The sea and salt flats surround the city on all sides, and in effect, prohibit further expansion without land fill.

Approximately 110 ha, or 21% of the city is built up, while 347 ha, or 67% of the land, is vacant. As indicated previously, most of the vacant areas were recently released from military control, and preliminary studies for development are being considered.

In terms of present land use, the northern coast of the promontory is occupied mainly by a fishing village. Recently improved port facilities are located on the northwest coast. In general, the northern third of the promontory is highly developed, with scattered housing extending toward the southeast. The southwest area of hilly terrain is the largest open land area available for development. Indeed, one of the critical issues for land use planning is the future use of the former military land in the southwest.

9-1-2 PROJECTED LAND USE  
AREA REQUIREMENTS

An analysis of Table 9-1-1 indicates that Jizan's future land use pattern should change in the following ways:

1. the city should allocate more land to residential use to accommodate its increasing population;
2. Because the city's industrial sector will grow rapidly in the next 20 years, it should devote a considerable amount of land to industry and warehousing;
3. As the income of city residents increases, there will be an increased need for commercial and business area;
4. In order to accommodate Jizan's increased residential, industrial, and commercial growth, more of the city's land area must be used for roads; and
5. For the purposes of developing a high level of residential amenity in Jizan, it is necessary for the city to devote more of its land to recreation and open space conservation.

Table 9-1-1  
EXISTING LAND USE AREA<sup>a</sup>

Activity	Area (ha)	%
Residential	83.3	16.0
Commercial	8.5	1.6
Industrial	4.3	0.8
Educational	2.5	0.5
Religious	1.2	0.2
Social	8.2	1.6
Military	17.7	3.4
Agricultural	-	-
Recreational	-	-
Cemetery	3.6	0.7
Vacant	346.9	66.7
Major Roads	43.8	8.4
<b>Total</b>	<b>520.0</b>	<b>100.0</b>

Notes:

- a. Jizan, Existing Conditions, Vol.I, Table 4-2-1.
- b. Includes temporary suqs.
- c. Include both built-up and non boult-up areas.

Land use policies developed in the previous chapters generally fall into two categories: (1) Policies related to relocation and to the assumed relationship between Existing and New Jizan, and (2) policies related to inter spatial organization of Existing Jizan. Among the first category of policies are:

1. The Master Plan will indicate a phased and orderly relocation of population and activities from Existing to New Jizan.
2. Existing Jizan will dominate Combined Jizan in terms of population and employment until sometime after 1985. The center of gravity moves from Existing to New Jizan, but the Combined Jizan made up of the two districts will be a unified metropolitan area, closely linked by communication and transportation.
3. Existing Jizan will change from a general urban center to a functionally specialized district within Combined Jizan.
4. Public and community services in Existing Jizan will cater almost exclusively to its own resident population. Similar services in New Jizan will be directed toward a wider, sub-regional service area.
5. The long-range population of Existing Jizan will be determined by the soil and environmental constraints of the city.

Among the second category of policies directed toward internal spatial organization of Existing Jizan are:

1. Land use in Existing Jizan will be determined primarily by the following physical factors:
  - a. Location of the port.
  - b. Location of the salt mine reserve land (reserved by the Ministry of Petroleum and Mineral Resources).
  - c. Soil condition and drainage.
  - d. Location of fishing port.
2. Houses in Old Jizan, i.e. the residential areas in the northern part of Existing Jizan, should be completely evacuated during the planning period, since:
  - a. They suffer from insanitary conditions.
  - b. Many of these houses also suffer from subsidence and structural damage.
  - c. They are located in area of poor drainage.
3. The plan organization and road network should be flexible in regard to future linkage with New Jizan, since, although the distance between Existing and New Jizan is known to be 8 to 15 km, the direction of New from Existing Jizan is unknown. The proposed road network consists of:
  - a. An outer ring road from which all required and large scale activities may be reached, and

- b. An inner ring road which ties together the residential and small scale activities.
4. Approximately 10 km of coastline southward from the old pier will be protected by open space and coastal preservation. A tourist and recreational center will be located in the vicinity of the point on the western coast.
  5. A new fishing port will be established on the north shore of Existing Jizan, with a coordinated development of support facilities for a fishing industry.
  6. Industrial, warehousing, wholesale, and distributional facilities will be located in the northwestern part of the city in proximity to the port.
  7. From consideration of available land and bearing capacity of soil, a target population of 8,000 inhabitants is proposed for Existing Jizan. Two residential neighborhoods, one east and one west of the salt mine reserve, will be developed to house this population. Existing Jizan as a whole will be considered as a combination sub-community/community for purposes of programming public and community services.





FIGURE 9-2-1  
1995 PROPOSED  
MASTER PLAN

scale 1:20,000

- \*1
- \*2
- \*3

elementary school and playground for boys	EB
elementary school and playground for girls	EG
intermediate school and playfield-level 1 for boys	IB
intermediate school and playfield-level 1 for girls	IG
secondary school and playfield-level 2 for boys	SB
secondary school and playfield-level 2 for girls	SG
teachers' school for boys	TB
teachers' school for girls	TG
technical school for boys	VB
technical school for girls	VG
colleges	U
special college	SU
neighborhood park	NP
community park or small city park	CP
city park	P
mosque	SM
jami'a mosque	JM
eid mosque	M
neighborhood center	NC
community center	CC
civic center	C
pharmacy	PH
sub-community diagnosis and treatment center	DT
community/general hospital	H
special hospitals and nursing home	SH
neighborhood shopping center	NS
community shopping center	CS
sub-regional shopping center	S
fire station	FS
post offices	PO
police station	PS
government offices	G

Jizan port	1
industry based on imported goods	2
warehouses and service industry	3
fishing wharf	4
fishery processing	5
fishermens' village	6
peir for tourism	7
coastal recreation strips	8
commercial based on recreation and tourism	9
pier for coast guard	10
coast guard	11
floating pier for oil tankers	12
petroleum reservoirs and related industry	13
gas and manufacturing	14
salt mine	15
salt processing	16
agricultural processing	17
truck terminal	18
warehouses	19
commercial center	20
public service offices	21
general hospital	22
prison	23
city park	24
old castle	25
sports park	26






NOTES:

- \*1 Existing facilities.
- \*2 Facilities proposed and approved by the Military of Municipal and Rural Affairs as of April 1978.
- \*3 Facilities newly proposed by the Master Plan in addition to these identified in \*1 and \*2.





Facilities are distributed according to the community structure established in accordance with Planning Standards. Facilities for neighborhoods, sub-communities, communities, and the city have been shown, but these for residential unit groups have been included as part of the general service requirements of the residential neighborhoods, hence are not shown in this plan. For further details concerning the service population, function, area, and other requirements for various facilities, see Appendix, Planning Standards.



Zoning Classification      Principal Land Use

<b>R1</b>	Low density residential	
<b>B</b>	Business and commercial	
<b>M</b>	Industrial and warehousing	
<b>P1</b>	Government and civic	
<b>P2</b>	Institutional	

Special District Classification      Principal Land Use

<b>S1</b>	Recreational	
<b>S2</b>	Non-agricultural conservation	
<b>S3</b>	Military	
<b>S4</b>	Restricted Development	

NOTES:

1. For a detailed discussion of zoning classification and requirements, see Southern Region, Final Physical Plan, Sec. 13-3, Legislation and Regulations.
2. Principal land use is the predominant land use activity associated with each zoning classification. See Summary of Permitted uses for classes of detailed land uses permitted for each zoning classification.
3. Non-agricultural conservation includes recreation, scenic, and, in Jizan, coastal conservation area.
4. Restricted development area is land unsuitable for development due to unfavorable topographic or geological conditions, land reserved for traffic and industrial buffer areas or land specially reserved for future use.





THE RED SEA



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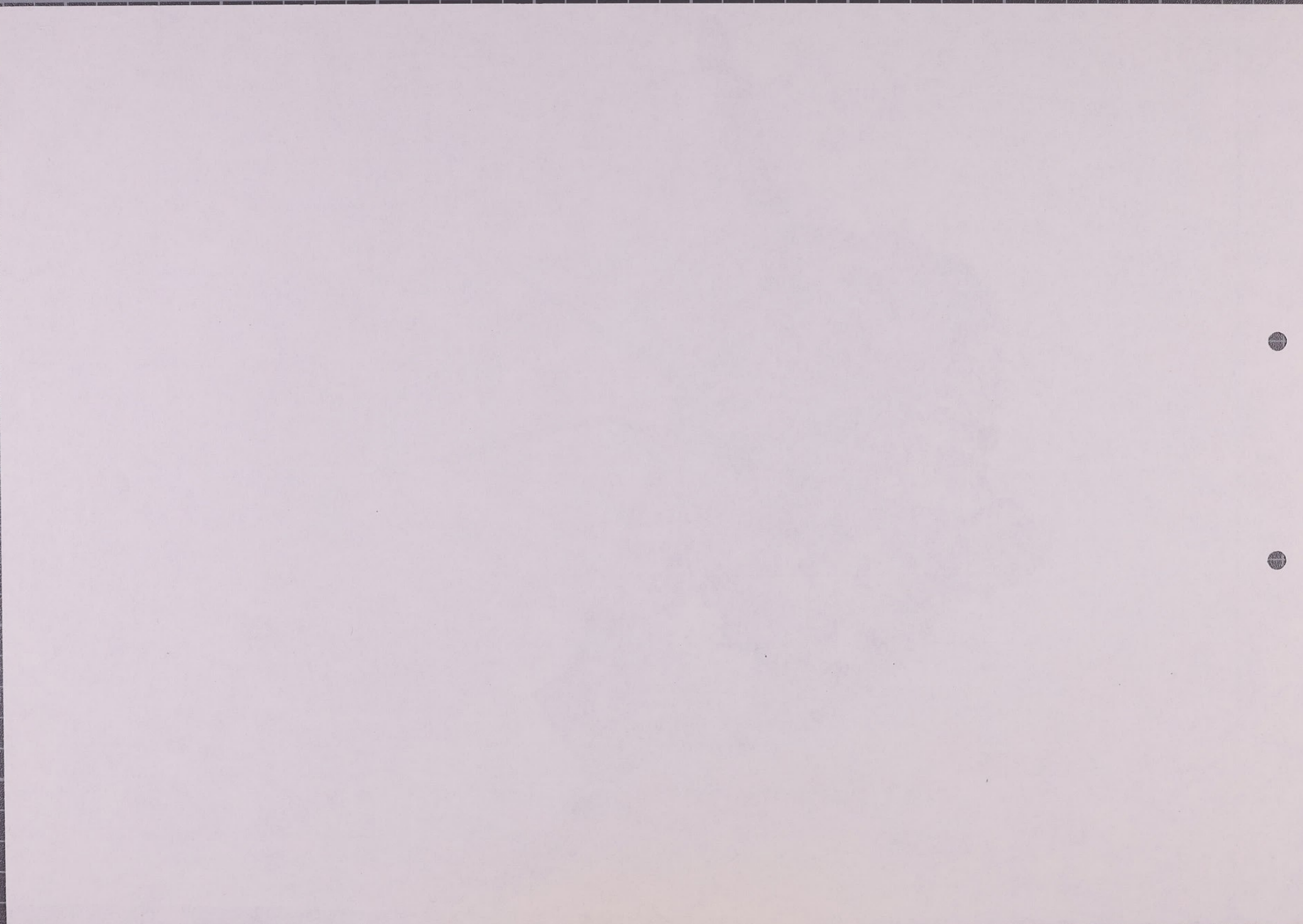
Salt Flats

Salt Flats

Salt Flats

Salt Flats

Salt Flats



9-3-1 DEVELOPMENT STRATEGY Because Jizan has peculiar geological, topographical, and environmental conditions, its urban development plan must be greatly molded by these conditions. The thrust of Jizan's development strategy can be generally described as follows.

Due to the extremely poor soil conditions in the north, the city's residential area should be moved to the southern area in order to take advantage of better soil conditions for construction there. This, coupled with the installation of an adequate water, sewerage, and drainage system, should reduce significantly any subsidence which occurs in Jizan's residential area.

Also, in order to capitalize on Jizan's potential as a port, it is necessary to locate the city's industrial area adjacent to the port. Therefore, the city's upcoming industries such as cement production and fish canning and the accompanying warehouse facilities should be located in the north in the former residential area.

Finally, in an attempt to foster a high quality of urban life and to store land for future needs, the new Jizan will have considerably more land devoted to recreation and open space.

During 1975 to 1980, decisions on relocation planning, and infrastructure are assumed to be completed. Work should be commenced for construction of communication and transport facilities between Existing and New Jizan.

9-3-2 PHASE I -  
1975 to 1980

During this time, some population in Existing Jizan will be moved out of the residential area in the north and moved into the new residential area in the South. In this vacated area, an industrial park will be developed. It should be mentioned that in the first phase of Jizan's residential development, only virgin land in the south will be built up and already built-up areas will be left untouched.

\* Implementation in residential area is mainly specified according to the population ratio to 1995 population as follows:

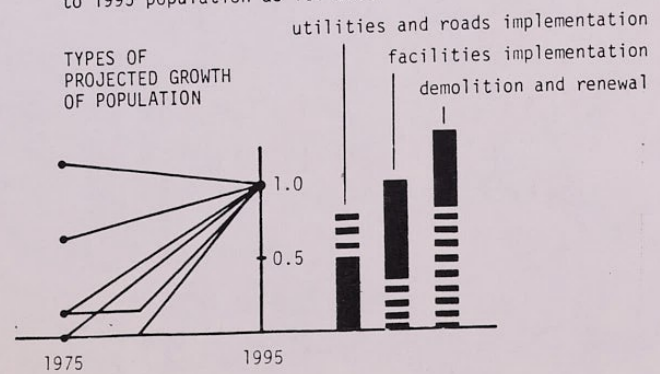











FIGURE 9-3-1  
PHASE I  
(1975-1980)  
scale 1:20,000

THE RED SEA



-  major road completed by 1975
-  major road implementation in Phase I
-  residential development
-  construction restriction
-  demolition and conservation
-  specified development in Phase I
-  planning area boundary



9-3-3 PHASE II -  
1980 to 1985

Assuming that infrastructure is sufficiently complete, the first phase of relocation should begin in 1980 and end in 1985. Employment locations, with the exception of public administration, will remain largely in Existing Jizan, hence many people relocated to New Jizan will need to commute back to Existing Jizan.

Phase II of Existing Jizan's development will take place as follows.

The industrial sector will continue to grow in the north. This growth will proceed northward toward the port and southward toward the geographical center of Jizan.

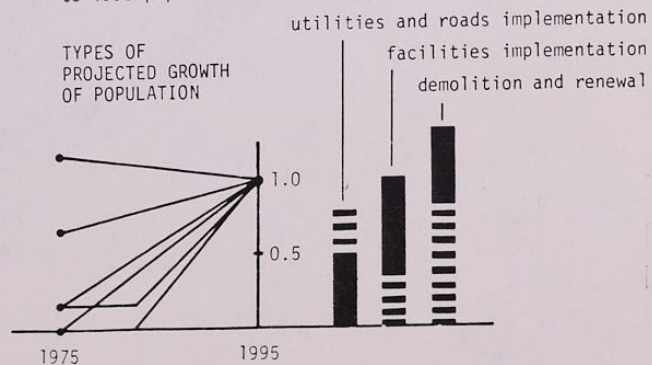
A road will be completed which will cover the entire western coast of the city. Outside of this road land will be preserved for recreation and resort purposes and for open space to be used in the future.

The residential development area will expand to cover the south-western and deep-western part of the city. This will leave only the long-established neighborhoods in the south-eastern part of the city to be re-developed.

Separating the industrial and new residential areas, a community park will be established. Its purpose will be to provide a common meeting place where residents of the city can interact through recreation, talking, etc.

Also, the second phase will see the expansion of Jizan's port and the beginning of construction of a new fishing port.









\* Implementation in residential area is mainly specified according to the population ratio to 1995 population as follows:





THE RED SEA

FIGURE 9-3-2  
PHASE II  
(1986-1985)  
scale 1:20,000

-  major road completed by 1980
-  major road implementation in Phase II
-  residential development continued from Phase I
-  demolition and conservation
-  specified development initiated in Phase II
-  specified development continued from Phase I
-  specified development completed in Phase I
-  planning area boundary

NOTE:  
Relocation to new city starts in Phase II.



9-3-4 PHASE III -  
1985 to 1995

During the final phase of the planning period, 1985 to 1995, relocation of population and facilities to New Jizan is completed. With the exception of 8,000 residents, largely employed in primary and secondary sectors, the population of Jizan has moved to New Jizan. Growth of employment in Existing Jizan has stopped, and the center of gravity of urban activities has shifted to New Jizan.

Within Existing Jizan, the internal relocation of population away from insanitary housing in Old Jizan is completed. Most of remaining houses in Old Jizan, with the exception of a special preservation area near the fishing port, are replaced by industrial and warehousing facilities associated with the port.

The new fishing port and support facilities are to be completed during this phase. Work is begun on the marina and the tourist/recreational center on the western coast of the peninsula.

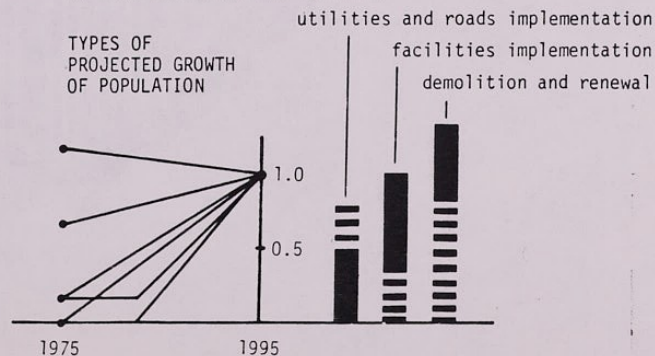
Finally, the Master Plan calls for the redevelopment of Jizan's old residential area along its central-eastern coast. With the re-development of this area, the development of Jizan's new residential area is complete.

9-4 CITY CENTER

In order to provide a focus and a center to the residential areas of Existing Jizan, a community/city central area should be established in the middle of neighborhood district 1.3, east of the salt mine reserve (see Fig. 9-2-1). A program for facilities to be included in this central area is summarized in Table 5-5-2.

The proposed location is a natural entrance to the residential community of Existing Jizan in 1995. Traffic destined for regional facilities on the outer ring road and that destined for residential facilities on the inner ring road are separated near the proposed location. Thus this site is accessible from both the regional road network and the two neighborhoods which comprise the reduced population of Existing Jizan.

\* Implementation in residential area is mainly specified according to the population ratio to 1995 population as follows:













THE RED SEA

FIGURE 9-3-3  
PHASE III  
(1985-1995)

scale 1:20,000

-  major road completed by 1985
-  major road implementation in Phase III
-  residential development continued from Phase II
-  renewal for industrial and park development
-  specified development initiated in Phase III
-  specified development continued from Phase II
-  specified development completed in Phase II
-  planning area boundary

NOTE:  
Relocation to new city continues from Phase II.



9-5 PROPOSED ACTION AREAS

The critical issues pertinent to Existing Jizan's land development can be summarized as follows:

1. Since there are only 520 ha of usable land in Jizan, the development of vacant areas formerly in the military zone is the key to land use in Jizan.
2. Large areas should be set aside for fishing-related activities and for port, cement, and related industries.
3. With the exception of some recently constructed houses in the central valley, housing in the coastal flat area should be eliminated for the most part.
4. New housing areas should be developed in the former military zone.
5. There should be a new city/community center.
6. Because there are leakages from metal water pipes caused by broken pipes or deterioration due to aggressive soil, the city's water pipes must be replaced. Also, to accommodate the growth of the city, they must be extended.
7. The city must develop an adequate sewerage network. Because the city currently has no sewerage system, insanitary conditions prevail and buildings are being damaged by induced subsidence.
8. The city desperately needs a drainage network to prevent flooding which occurs in the northern and northwestern parts of the city.
9. There is a definite need for an improved garbage collection system.
10. Careful studies should be undertaken to make sure that Jizan's infrastructure is sufficient to accommodate the development of its full potential as a city.

The Ministry of Municipal and Rural Affairs had earlier commissioned a study for a sewerage system in Jizan [2], which was not implemented. Since circumstances have greatly changed since that time, particularly with respect to relocation, it is recommended that a new study be conducted, taking into consideration relocation as well as potential use of the formerly military land.

The Master Plan presented in this report summarizes the long-range policy guidelines related to (1) density, (2) land use, (3) general locational policy, and (4) structural organization of the city. Detailed implementation should be developed subsequent to this report. The Planning Standards appended to this report form the linkage between the Master Plan and the detailed local plans which follow.

CHAPTER 9 NOTES:

1. See Jizan, Existing Conditions, Vol. I, Fig. 8-2-1.
2. Government of Saudi Arabia, Report on Sewage Disposal and Stormwater Drainage in Jizan, J. D. & D. M. Watson, Consulting Civil Engineers, August 1969.

9-6 RELATIONSHIP OF THE MASTER PLAN TO THE DETAILED LOCAL PLANS

Due in part to the uncertainty associated with relocation, detailed local plans for Jizan are somewhat limited. The Master Plan has fully incorporated the following local plans:

1. The general plan of the city of Jizan, prepared by the Department of Town Planning, Southern Region [1], particularly in regard to,
  - a. Coastal open space conservation.
  - b. Industrial area adjacent to the port.
  - c. Salt mine reserve land.
2. The residential development at the southeast corner of Existing Jizan.
3. Plan for various governmental facilities, including plans for a prison, a general hospital, a coast guard station, and other, to be located southwest of the residential development noted in item 2.

REPRODUCED FROM THE ARCHIVES OF THE NATIONAL ARCHIVES OF SAUDI ARABIA

10. administration and management

10-1 TOWN PLANNING  
LEGISLATION AND  
ADMINISTRATION

10-1-1 EXISTING LEGISLATION  
AND ADMINISTRATION

In the Kingdom of Saudi Arabia, the main responsibility for urban and regional planning lies with the Deputy Ministry for Town Planning Affairs. The office for the Southern Region is the Department of Town Planning in Abha, which coordinates regional planning activities. It is believed that the responsibilities and decision making of the department of town planning in Abha should be increased, that is to enable the department to avoid delays and to meet the local needs and requirements of the Southern Region.

10-1-2 PROPOSED MANAGEMENT  
FRAMEWORK

Three alternatives were suggested in the Alternative Strategic Report. Number 2 was chosen because it seemed more realistic and offered greater promise of realization than the other two. It proposes to "Establish uniform codes of regulations limited in scope to general statements of objectives to provision of planning and development procedures. Establish a network of planning offices in each region and province, equipped with broad powers to interpret, elaborate, and administer the nationally formulated regulations. These regional planning offices would be branch offices of the central planning authority." [2]

To elaborate, it is suggested first that the Master plan be read into existing law to eliminate some of the problems discussed in the previous section. Second, it is proposed that the planning process be decentralized by making the Deputy Ministry in Riyadh responsible only for long range

planning. Local, regional and municipality offices should then be allowed to interpret and execute the Plan without further consulting Riyadh. The delegation of authority should make the process more efficient, more responsive to local needs, and less cumbersome.

Third, a comprehensive management framework requires enacting a general zoning act, tailoring each city's Master Plan to it and thereby creating a zoning map for each city. The question as to how and in what way this will work will be discussed in Section 10-3.

Finally, the Deputy Ministry for Town Planning should have an annual budget, with only very general guidelines given as to the allocation of funds and the specifics left to the municipal office in question. Presently, there must be an item-by-item approval from Riyadh, although clearly the Deputy Ministry must still continue to have some control over the trade-off of funds from sector to sector.

10-2 DEVELOPMENT AND  
IMPLEMENTATION  
PROGRAM

10-2-1 PRIORITIES AND  
PHASING

Development priorities can be indicated by the phasing of investment and the share of public investment in the total investment requirements. In general, the following rule is assumed in preparing a public investment schedule: the standards of facilities in all sectors will be raised by 1985. Therefore, public investment will by that time be attempting to achieve two objectives simultaneously:

1. raising the standards of existing facilities; and
2. providing additional facilities to an increased population.



In essence, public investment attempts to give a growing population adequate facilities, while replacing old stock.

The extent of public investment within the total required capital investment is assumed as follows:

1. Housing	
a. Site Development	100%
b. Housing Construction	30%
2. Educational Facilities	100%
3. Recreational Facilities	100%
4. Social and Religious Facilities	100%
5. Health and Welfare Facilities	100%
6. Commercial Facilities	100%
7. Public Facilities	100%
8. Public Utilities	
a. Power Facilities	100%
b. Other Facilities	100%
9. Industrial Facilities	20%
10. Transportation Facilities	100%

In Jizan, public investment should follow two criteria:

1. the recommendations that have been suggested in the development strategy and indicated for each phase of the plan; and
2. the priorities which have been established in the sections on Proposed Action Areas (10-5) and the City Center (10-4).

New parts of the city will be developed over time as indicated in the various phases. Investment should follow the overall phasing, going into the residential and industrial areas, and then into the city center. However, certain problems will need immediate attention. Such projects as water, sewerage, and drainage will demand heavy public investment.

#### 10-2-2 CAPITAL INVESTMENT PROGRAM

Public investment will be greatest in the first phase, fall during the second phase, and fall again by approximately the same amount during the third. In all phases the heaviest public investment will take place in housing, although it is expected to decrease by almost half in the third phase of the plan. The next heaviest sector across all years is education. The only exception to this is public investment in transportation which during Phase I of the plan exceeds public investment in education. Smaller but relatively equal expenditures can be expected in public utilities and social and religious facilities with considerably less devoted to recreation, health and welfare facilities, commercial facilities, public facilities and industries during all phases from 1975-1995. In general, by 1995 public

investment should taper off in all sectors with the exceptions of education and public utilities.

#### 10-3 ZONING REGULATIONS AND ADMINISTRATIVE MEASURES

The purpose of zoning regulations is to safeguard the health, safety, and welfare of the community as well as to insure that land is available for the purposes designated in the Master Plan. With growth and development, legal issues will arise as to land use. If these issues are decided on a case by case basis, development will be slow and regulatory measures may be undermined.

Zoning is essentially a legal instrument for the implementation of land use policies called for by the Master Plan. A zoning ordinance divides the land area within the municipal boundaries into zones. It designates the classes of industry, trade, commerce, business, residence, and other purposes for which structures are to be used in each district. Also, it imposes varying standards of development such as set-backs, height, bulk, and other requirements for buildings and other structures to be constructed, reconstructed, altered, or repaired.

Zoning regulations should be ratified as a legal document and administered by the Building Departments in various municipalities. Applicants for building permits would have to submit the necessary documentation, including plans and specifications to the Building Department, and no permit would be granted for work not in conformity with its standards.

Districts should be zoned as:

1. Agricultural
2. Residential (high, medium, and low density)
3. Business and Commercial
4. Light and Heavy Industry
5. Public Land
6. Special Districts such as areas to be conserved.

The way in which Jizan should be zoned can be seen from the land use map prepared for 1995 and from the attached zoning map. Therefore, the Master Plan calls for Jizan to be zoned in the following way:

1. the northwestern area of the city near the port should be zoned for light and heavy industry. Also the southeastern-most part of the city should be zoned for petroleum-related industries.
2. the central and southern part of the city should be zoned as a residential area.

Table 10-2-1  
IMPLEMENTATION PROGRAM, JIZAN<sup>a</sup>

	1975			1975 - 1980			1980 - 1985			1985 - 1995		
	NUMBER	TOTAL FLOOR AREA (m <sup>2</sup> )	TOTAL LAND AREA (ha)	PHASE I			PHASE II			PHASE III		
				NUMBER	TOTAL FLOOR AREA (m <sup>2</sup> )	TOTAL LAND AREA (ha)	NUMBER	TOTAL FLOOR AREA (m <sup>2</sup> )	TOTAL LAND AREA (ha)	NUMBER	TOTAL FLOOR AREA (m <sup>2</sup> )	TOTAL LAND AREA (ha)
BOYS ELEMENTARY <sup>b</sup>	6	12,200	8.6	1	1,800	1.3	- 1	-3,200	-2.2	- 4	- 6,500	-4.6
BOYS INTERMEDIATE <sup>b</sup>	1	6,500	5.0	0	1,300	1.0	0	-1,900	-1.5	0	- 3,200	-2.5
BOYS SECONDARY <sup>b</sup>	1	3,500	3.8	0	700	0.7	0	-1,000	-0.9	0	- 1,800	-2.1
BOYS HIGHER EDUCATION <sup>c</sup>	1	1,200	0.5	0	200	0	0	- 300	-0.1	0	- 600	-0.2
GIRLS ELEMENTARY <sup>b</sup>	6	12,200	8.6	1	1,800	1.3	- 1	-3,200	-2.2	- 4	- 6,500	-4.6
GIRLS INTERMEDIATE <sup>b</sup>	1	6,500	5.0	0	1,300	1.0	0	-1,900	-1.5	0	- 3,300	-2.5
GIRLS SECONDARY	1	2,100	2.3	0	400	0.4	0	- 600	-0.6	0	- 1,060	-1.2
GIRLS HIGHER EDUCATION <sup>c</sup>	1	700	0.3	0	200	0	0	- 300	-0.1	0	- 300	-0.1
TOT-LOT	96		4.8	16		0.8	-96		-0.8	-64		-3.2
PLAY-LOT (KINDERGARTEN)	24		4.8	32		0.8	-32		-0.8	-16		-3.2
NEIGHBORHOOD PARK	6		11.0	1		2.0	- 1		-3.0	- 4		-9.6
COMMUNITY PARK	1		8.9	0		1.5	0		-2.4	0		-4.8
MOSQUE	6	6,660	1.8	1	1,140	0.3	- 1	-1,800	-0.3	- 4	-3,600	-1.2
JAMI'A MOSQUE	1	2,660	0.8	0	6,700	0	0	-6,960	0	0	-1,440	0
NEIGHBORHOOD CENTER	6	1,110	3.0	1	190	0.5	- 1	- 300	-0.5	- 4	- 600	-2.0
COMMUNITY CENTER	1	220	1.0	0	40	0	0	- 60	0	0	- 120	0
PHARMACY	6	1,110	0.6	1	190	0.1	- 1	- 300	-0.1	- 4	- 600	-0.4
DIAGNOSIS/TREATMENT	1	1,110	0.7	0	190	0.1	0	- 300	-0.2	0	- 600	-0.4
COMMUNITY/GENERAL HOSPITAL	0	0	0	0	0	0	0	0	0	0	0	0
beds												
ADMINISTRATION		16,000	0.8		3,500	0.2		500	0		-3,300	-0.2
POPULATION/HOUSEHOLDS		22,160/3,409			3,840/1,074			-6,000/-1,286			11,200/-2,773	

Table 10-2-1 NOTES:

- a. This table represents the facilities implementation programme for each phase of the master plan based on the application of the Planning Standards (detailed in the Appendix) to the projected populations.

For 1975 this means that the figures shown represent the proposals of this master plan rather than the existing conditions. TPO planners may compare these figures with the existing conditions to determine shortfalls in existing facilities. This method was chosen for 1975 because the very rapid pace of development implementation would have made the presentation of a comparison of existing facilities to facilities currently required by the planning standards immediately obsolete.

The figures for Phases I, II and III represent the increments of facilities to be added to those of the previous phases in order to meet the requirements of the planning standards.

To use boys elementary schools as an example, in 1975 there should be 8 schools with a total floor area of 12,600 m<sup>2</sup> and a total land area of 9.0 ha. By the end of Phase I there should be an additional 2 schools with 4,050 m<sup>2</sup> of floor area and 2.8 ha of land. Therefore by 1980 there should be 10 elementary schools (8+2) with a total land area of 16,650 m<sup>2</sup> (12,600 + 4,050) and a total land area of 11.8 ha (9.0 + 2.8). This method is carried out for each phase, with only the increments being shown and not the totals, and is intended to facilitate implementation and cost planning for each phase.

It was decided in discussions with the TPO and its U.N. advisors that it would be undesirable to give monetary figures for this implementation program because the instability of construction costs and rapid and uncertain inflation would soon render such figures meaningless. It is felt to be a much better policy to give only numbers and areas of proposed facilities and have the expert financial planners of the Ministry prepare financial analyses as they become needed. In this way the implementation program of this master plan can be kept constantly up-to-date and meaningful.

- b. Land area for boys and girls elementary, intermediate and secondary schools includes appropriate associated recreation areas. See Chap. 5, Sec. 5-1 for details.
- c. Higher education facilities for boys and girls includes teachers and technical schools, but not colleges and universities. See Table 5-1-1.

3. the area along the western coast outside of Cornice Road should be zoned as a recreation area.

#### 10-3-1 CONTROL OF DEVELOPMENT IN OUTSKIRTS

Jizan is bordered by the Red Sea on the west and by salt flats on the east. Hence the city is not surrounded by open, developable lands, as in the other major cities of the Southern Region. There is a natural limit on the extent of urbanized area. Recently, however, some residents have constructed simple shelters on salt flats near the northern coast of the promontory. As residential lands are created in New Jizan, it is recommended that all construction on salt flats be prohibited without a sufficient study of foundation engineering.

Within the city of Existing Jizan, coastal open-space conservation, where applicable, should be strictly enforced. The visual and environmental attractions of Existing Jizan will depend much on the quality of its coasts and beaches.

#### CHAPTER 10 NOTES:

1. For further information see Jizan, Existing Conditions, Volume I, Section 8.
2. Alternative Strategies, Section 9-3.



appendix: community planning standards

RODUCTION

Planning standards and community facility design criteria are studied and summarized in this chapter. They are given here as a set of guidelines for facility planning and community grouping strategy. Obviously planning standards should vary from one locality to another reflecting different local needs and conditions. Standards should also vary from one state to the next in the development process reflecting the different constraints of each stage of development. Meanwhile standards applicable to relatively wide ranges of situations are also needed before a locally specific set of standards is created. The general standards are needed to determine or reflect policies for the region or areas covering more than one city. The study here was intended to create a set of standards with ranges wide enough to reflect all of the five cities' situations yet narrow enough to function as a guideline for the relatively detailed community planning. The standards provide recommended rigid target figures as well as their acceptable ranges providing strong guidelines whenever needed, as well as flexibility to adapt to local conditions. The standards are based on our understanding of the planning area and our general knowledge and philosophy gained through experience in other projects.

The standards for most items (such as service radius, population served and required land) depend on residential density and overall population size. In the first section of this appendix, the characteristics of population and its density are summarized for the five cities for both existing and future situations, providing the basic background reasons for the range of standards and the population grouping described in the later sections. In the second section, planning standards are described for each type of facility. They contain, as mentioned above, the recommended target numbers and their acceptable ranges. The third section presents a hypothetical example of a city of 60,000 and the distribution of land uses required.

should reflect this fact. The standard is to be applied not to the large city of population over 100,000 nor is to be applied to the small rural village of population less than 10,000. The standard here, therefore, should cover mainly the population group scale of normally called "Neighborhood" scale (population of order of  $10^3$ ) and normally called "Community" scale (population of order of  $10^4$ ). The population group scale normally called "Region" (population of order of  $10^5$ ) should also be discussed but the former two scales should be given more emphasis.

It should also be noted that the expected population increase for each city is over 100% in average and some city like Bishah is expected to grow over 200%. In this kind of rapid growth usually the protection of group privacy becomes seriously difficult due to the fact that, for example, the once quiet residential neighborhood is bisected by the traffic which should belong to much higher level of grouping order than neighborhood or it is exposed to the regional traffic with unacceptable proximity without any buffer. The standard should cover the problem related to this matter i.e. standards for buffer zone, street heirarchy and group privacy dealing with the rapid growth of the cities.

Table A-1-1  
SURVEY POPULATION<sup>a</sup> 1975 and 1995

	1975 <sup>b</sup>	1995 <sup>c</sup>	Increase
Abha	21,900	66,000	200%
Khamis Mushayt	29,300	85,000	190%
Najran	27,200	59,000	120%
Jizan	22,200	41,000	80%
Bishah	7,900	23,000	190%
Nimas Village Cluster	7,100	11,640	164%

- Notes: a. Population for KTU survey area only (not necessarily represent "city population")  
 b. Southern Region Project Study, Existing Conditions many Master Plans.  
 c. Southern Region Project Study, KTU estimate, in the area inside of KTU socio economic survey area.

A-1 DEMOGRAPHIC AND DENSITY FRAME FOR STANDARDS

A-1-1 POPULATION

Table A-1-1 shows population of five cities in 1975 and 1995. In 1995 each of five cities has population of somewhere between 30,000 to 70,000. The planning standards to be described

A-1-2 POPULATION DENSITY

Table A-1-2 (a) summarizes the 1975 and 1995 population densities for the five cities. The Table indicates that density is low in overall city area in 1975 and therefore, in the next twenty years "in-fill" type of development is possible and recommended rather than "sprawl" type of development. The planning standards should reflect this fact. Unnecessarily low density developments in the central area should be discouraged or prohibited through these standards.

From Table A-1-2(a), following approximations are made:

1. Each city as a whole has a density of 10 pph (person per hectare) to 40 pph in 1975, and estimated density in 1995 is somewhere between 20 and 120 pph.
2. Each city's central district (approximately 100 to 200 ha area) has a density of 50 to 150 pph.
3. Each city's highest density zone (approximately 10 to 40 ha area) has a density of 100 to 200 pph.

It is also assumed that the central district density will increase from 50 to 75% and the density of a city's highest density zone may increase up to 200 pph due to the limited availability of land and of the peripheral area. If no renewal is done, no density increase is expected in the central zone. The standards should be written with a wide enough range to enable planning within the density ranges listed.

Table A-1-2(b) summarizes the density range used for the determination of planning standards.

A-1-3 SCHOOL AGE GROUP DISTRIBUTION

Table A-1-3(a) shows the per cent share per age of children in the total population. The numbers are based on the results of the 1975 5% Sample Survey. From this table it is apparent that there are 3 to 4 (3.01 to 4.20, to be exact) children per age per 100 population for the age group 0 to 9, and there are 2 to 2.5 (1.95 to 2.69, to be exact) children per age per 100 population for the age group 10 to 19. An analysis of the existing conditions indicates that the population pyramids in the cities of the Southern Region do not have normal, stabilized characteristics due to a lack of working age population. In a normal and growing population, approximately 3% and 2.5% of the total population are estimated for the age group of 0 to 9 and 10 to 19, respectively.

Presently larger numbers of children exist in

Table A-1-2(a)  
POPULATION DENSITY 1975 and 1995 (pph)<sup>a</sup>

	CITY AVERAGE		CENTRAL DISTRICT		HIGHEST DENSITY ZONE	
	1975	1995	1975	1995	1975	1995
Abha	20 (1100 HA)	60	50 (150 HA)	150	150 (10 HA)	200+
Khamis Mushayt	40 (720 HA)	120	100 (230 HA)	150	200 (10 HA)	200+
Najran	10 (3400 HA)	20	100 (70 HA)	150	100 (40 HA)	200+
Jizan	40 (500 HA)	80	150 (100 HA)	150	200 (10 HA)	200+
Bishah	20 (470 HA)	60	50 (100 HA)	150	100 (20 HA)	200+

Note: a. From Southern Region Study, Existing Conditions. The nearest multiple of 10 and 50 in "City Average" column and other columns respectively. City areas are defined as the 5% sample survey areas.

Table A-1-2(b)  
APPLICABLE DENSITY RANGE FOR PLANNING STANDARDS

	DENSITY RANGE (pph)	EXAMPLE
Low Density	Up to 50	1975 City Average
Low-Medium Density	50 to 100	1975 Central District 1995 City Average
Medium Density	100 to 200	1975 Highest Density Zone 1995 Central District
High Density	200 and up	1995 Highest Density Zone

these five cities than in normal cities. In the future, this deviation may be reduced by regaining working age populations back to these cities. Table A-1-3(b) indicates the range of children population taken into consideration in the determination of the standards.

Analysis of the existing distribution of the numbers of boys and girls indicates that boys and girls number basically the same for each age group, and the standards do not need to differentiate between the two, although ratio of school enrollment may differ between the sexes.

Table A-1-3(a)  
POPULATION OF AGE GROUP 0 TO 19 IN THE FIVE CITIES<sup>a</sup>  
NUMBER OF CHILDREN PER AGE OUT OF 100 POPULATION  
EXISTING CONDITIONS IN THE FIVE CITIES

AGE GROUP	ABHA	BISHAH	JIZAN	KHAMIS MUSHAYT	NAJRAN	AVERAGE	CASE
0 TO 9	3.5	3.9	3.0	3.9	4.0	3.7	3.0
10 TO 19	2.3	2.5	2.7	2.0	2.1	2.5	2.5

NOTE: a. Southern Region Project Study, Existing Conditions

Table A-1-3(b)  
APPLICABLE RANGE OF CHILDREN POPULATION FOR PLANNING STANDARDS

AGE GROUP	NUMBER OF CHILDREN OUT OF 100 POPULATION
0 TO 9	3 TO 4 Children/age
10 TO 19	2 TO 3 Children/age

Based on the Table A-1-3(b), Nursery-Kindergarten enrollment is desired as following:  
If Nursery-Kindergarten (ages 3 to 5) enrollment is 25 or 50% of the total population of that age group, the enrollment may be calculated to be between 2.25% and 6.0% of the total population as shown below:

	25% ENROLLMENT	50% ENROLLMENT
3% per age x 3 ages = 9%	9% x 25% = 2.25%	9% x 50% = 4.5%
4% per age x 3 ages = 12%	12% x 25% = 3.0%	12% x 50% = 6.0%

Also based on the Table A-1-3(b), Elementary School enrollment is derived as following:  
Elementary School age group is 6 through 11 and the enrollment rate should be very close to 100% for both boys and girls. Therefore 16% to 22% of the total population may be estimated for elementary school enrollment (total of boys and girls) as shown in the following calculation:

$$3\%/Age \times 4 \text{ ages (6,7,8 and 9)} + 2\%/Age \times 2 \text{ ages (10,11)} = 16\%$$

$$4\%/Age \times 4 \text{ ages (6,7,8 and 9)} + 3\%/Age \times 2 \text{ ages (10,11)} = 22\%$$

Intermediate School age group is 12 through 14, and close to 100% of the age group population should be enrolled. Intermediate School enrollment thus is estimated to be somewhere between 6% and 9% (total of boys and girls) of the total population (See below):

$$2\%/Age \times 3 \text{ ages (12,13 and 14)} = 6\%$$

$$3\%/Age \times 3 \text{ ages (12,13 and 14)} = 9\%$$

For secondary schools, enrollment in 1995 is assumed to be somewhere around 37.5% of the age group population (15,16 and 17). Secondary school enrollment is expected to be somewhere between 2.25% and 3.38% of the total population.

$$2\%/Age \times 3 \text{ ages (15,16 and 17)} \times 37.5\% = 2.25\%$$

$$3\%/Age \times 3 \text{ ages (15,16 and 17)} \times 37.5\% = 3.38\%$$

#### A-1-4 SUMMARY OF DEMOGRAPHIC AND DENSITY FRAMEWORKS

The key elements to be taken into consideration of planning standards which have been discussed individually, are analyzed in a combined way. Table A-1-4 shows potential population grouping on the left hand side, density and enrollment ranges across the top, and the combined implications on the contents of the table. The combined implications are in terms of land area requirements for each population group, service radii, and school enrollments.



Table A-1-4  
SUMMARY OF POPULATION GROUP, DENSITY, AND ENROLLMENT

POPULATION GROUP RANGE	DENSITY RANGE		RANGE OF ENROLLMENT								
	50pph	100pph	200pph	2.25%	6.0%	16.0%	22.0%	6.0%	9.0%	2.25%	3.38%
500	10 <sup>a</sup> (178) <sup>b</sup>	5 (126)	2.5 (89)	12 <sup>c</sup>	30	80	110	30	45	11	17
10 <sup>3</sup> =1000	20 (252)	10 (178)	5 (126)	23	60	160	220	60	90	23	34
5000	100 (564)	50 (399)	25 (282)	115	300	800	1100	300	450	112	169
10 <sup>4</sup> =10000	200 (798)	100 (564)	50 (399)	230	600	1600	2200	600	900	225	338
50000	1000 (1784)	500 (1261)	250 (892)	1150	3000	8000	11000	3000	4500	1125	1690
10 <sup>5</sup> =100000	2000 (2523)	1000 (1784)	500 (1261)	2300	6000	16000	22000	6000	9000	2250	3380

Notes: a. Land Area for Group Population in Hectares.  
b. Service Radius in m.  
c. School Enrollment

The table indicates that a population of 10<sup>3a</sup> (i.e. an a-multiple of population group 10<sup>3</sup>) provides a normally acceptable range of elementary school enrollment per school when the value of a is between 2.5 and 5, and the resulting elementary school enrollment (160a to 220a) is 400 to 1100. In this case the service area (20a to 5a) is 100 ha to 12.5 ha, and its radius from the center to the edge is 600m to 200m (for densities between 50 pph and 200 pph) which is equivalent to 10 to 3 minute walking distance. If one elementary school (if boys' and girls' schools are counted separately, then two schools) is located in this territory then both the number of enrollment per school and the walking distance to the school are acceptable to the standards recommended.

The table also indicates that a population of 10<sup>4b</sup> (i.e. a b-multiple of population group 10<sup>4</sup>) provides a normally acceptable range of intermediate school students per school when the

value of b is between 1 and 2, and the resulting intermediate school enrollment (600b to 900b) is 600 to 1800. In this case the service area (200b to 50b) is 400 ha to 50 ha, and its service radius is 1200m to 400m (for the densities between 50 pph and 200 pph) which is equivalent to 20 minute to 6 minute walking distance. If one set of boys' and girls' intermediate schools is located in this territory then both the number of enrollment per school and the walking distance to the school are within the acceptable range of the standards recommended.

The table also shows that a population of 10<sup>4b</sup> (i.e. a c-multiple of population group 10<sup>4</sup>) provides a normally acceptable range of secondary school enrollment per school when the value of c is between 2 to 4, and the resulting enrollment (225c to 338c) is 450 to 1352. In this case, the service area (200c to 50c) is 800 ha to 100 ha and the service radius is 1600m to 560m (for the densities between 50 pph to 200 pph) which is equivalent to 25 to 8 minute walking distance. If one set of boys' and girls' secondary school is located in this territory then both the number of enrollment per school and the distance to the school are acceptable to the standards recommended.

From these findings, the following observations may be made for the densities and population characteristics of the cities in the region:

1. Elementary School oriented territory includes a population of 2,500 to 5,000 (3,750 represents the range as typical).
2. Intermediate School oriented territory includes a population of 10,000 to 20,000 (15,000 represents the range as typical).
3. Secondary School oriented territory includes a population of 20,000 to 40,000 (30,000 represents the range as typical).

Obviously the standards recommended are not so restrictive as to exclude possibilities other than those listed above. However, the range definition is justifiable not only because of the acceptability of the key standard elements normally used by the consultant but also because of the convenience in establishing a hierarchical order of population grouping. As mentioned in A-1-1 of this section, the grouping of population with order of 10<sup>3</sup> is conventionally called "Neighborhood" and the grouping of population with order of 10<sup>4</sup> is called "Community". The elementary school oriented territory defined above corresponds to a "Neighborhood" and the intermediate and secondary school oriented territories correspond to a "Community". Taking

these traditional names and the hierarchical, structural character of the grouping into consideration, the following pattern and names are used:

Table A-1-5  
SUMMARY TABLE OF POPULATION GROUPING

GROUPING LEVEL	NAME OF GROUPING	TYPICAL POPULATION
G <sub>0</sub> (Level 0)	Residential Unit Group	250
G <sub>1</sub> (Level 1)	Sub-Neighborhood	937 (Say 1000)
G <sub>2</sub> (Level 2)	Neighborhood	3,750 (2,500 to 5,000)
G <sub>3</sub> (Level 3)	Sub-Community	15,000 (10,000 to 20,000)
G <sub>4</sub> (Level 4)	Community	30,000 (20,000 to 40,000)

G<sub>0</sub> and G<sub>1</sub> represent sub-areas of a neighborhood to function as the smallest units of territories for intimate social activities.

A "Residential Unit Group", as the smallest grouping, provides at its center a tot-lot and seating areas for the approximately 250 residents who live in the vicinity. The service radius and scale are so small and intimate that these shared outdoor spaces are conceived almost as extensions of living room activities.

A "Sub-Neighborhood" provides nursery-kindergarten and other facilities whose immediate accessibility from the residential area and whose sense of spatial intimacy is crucial. Using Table A-1-4, it is estimated that each G<sub>0</sub> group has a territory of 5 ha to 1.25 ha with a radius of 120m to 60m (2 to 1 minute walking distance); each G<sub>1</sub> group has a territory of 20 ha to 5 ha with a radius of 250m to 125m (i.e. 4 to 2 minute walking distance), and 23 to 60 nursery-kindergarten enrollment.

The following sections assume these basic grouping ideas as guidelines. The ideas in this section, in turn, were influenced by a study of each set of standards summarized in the next section.

## A-2 PLANNING STANDARDS FOR EACH FACILITY

### A-2-1 PLANNING STANDARDS FOR EDUCATIONAL FACILITIES

#### A-2-1-1 NURSERY-KINDERGARTEN

Age of Children:	3 through 5
Enrollment:	25% to 50% of age group population is enrolled. 9% to 12% of the total population is in this age group. Therefore, 2.25% to 6% of the total population is enrolled.
Population Served:	Approximately 1000 with an acceptable range of 500 to 1,500.
Size of Facility:	40 pupils/school with an acceptable range of 20 to 80.
Radius of Area Served:	Maximum 200m (3 minute walking distance) is recommended. 600m (10 minute walking distance) is also acceptable if density is less than 50 pph.
Sub-Unit:	20 pupils/class (3 year old); 25 pupils/class (4 year old); 30 pupils/class (5 year old). 1 nurse and 1 assistant for each class are recommended.
Land Area Requirement:	5m <sup>2</sup> /pupil is recommended (3m <sup>2</sup> to 7m <sup>2</sup> /pupil is acceptable) for building area and service area. For play area (see next section, "Nursery-Kindergarten Playlot".)
Floor Area:	3m <sup>2</sup> /pupil is recommended (2m <sup>2</sup> to 4m <sup>2</sup> /pupil is accepted).
Location:	It shall be closely located to the center of gravity of residential sub-neighborhood and away from major traffic. Play lot is either a part of or closely located to it.
Other Requirement:	3 and 4 year old children could be separated from the 5 year old children if there is room. (Although ages are close, there is a substantial difference of activity between the two groups.) Mixed for boys and girls.

#### A-2-1-2 ELEMENTARY SCHOOL FOR BOYS

Age of Children:	6 through 11 ( 8% or 11% of total population) Boys only
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Enrollment: Close to 100% of age group population is enrolled. 8% to 11% of the total population is enrolled (boys' school). Ministry of Education Standards (M. E. Standards) indicates that 10% of the total population is equal to the expected enrollment for boys' elementary school.

Population Served: 3,750, say 4,000, is recommended. 2,500 to 5,000 is acceptable. (Even a further deviation may be acceptable with good planning reasons.)

Size of Facility: 375 enrollment (boys only) is recommended. 200 to 550 is acceptable. (M. E. Standards indicate 450 pupils/school = 30 pupils/classroom x 15 classrooms.)

Radius of Area Served: Maximum of 300m (i.e. 5 minute walking distance), 600m (10 minute) is also acceptable. If density is less than 50 pph, and a school bus system is developed, then further expansion of the radius is also acceptable.

Sub-Unit: 30 pupils/class is recommended. 20 - 40 pupil/class is also acceptable. (M. E. Standards indicate 30 pupils/class and 15 classes/school.)

Land Area Requirement: 12m<sup>2</sup>/student is recommended for building and site area.\* (12m<sup>2</sup>/student x 375 student = 0.5 ha) plus 400m<sup>2</sup> for play area for lower grades exterior activity is recommended. Playground for upper grade athletic program is located either in, or close to, the school site. Playground standard is given later. Minimum width of site is 80m. But less than 80m is also acceptable if accompanied by an acceptable layout plan. (M. E. Standards recommend 100m x 100m site; 80m x 95m as minimum.)

Floor Area: 4.5m<sup>2</sup>/student, i.e. 1700m<sup>2</sup>/375 student is recommended. 3m<sup>2</sup> to 6m<sup>2</sup>/student is also acceptable depending on the degree of programs for non-classroom facilities such as library, special purpose rooms and indoor athletic play facilities.

Location: It should be situated in the center of grouping Level 2, i.e. "Neighborhood). It should be accessible by footpath from residential areas not interrupted by major auto traffic, even by the distributor roads. It should be separated from the girls' school.

NOTE: \* School "building and site" area is the area within which school buildings, access drive-way, drop-off, parking areas, court and gardens, landscaped areas and other ancillary facilities are located. Athletic play ground (or play field) and formal paved play area are excluded from the "building and site" area.

Other Requirement:

Playground should be a part of or close to the school. Elementary schools should be integrated with neighborhood shopping and neighborhood cultural facilities to create a multi-activity "Neighborhood center". Play area of the school should be fenced from the street.

#### A-2-1-3 ELEMENTARY SCHOOL FOR GIRLS

Age of population, population served, radius of area served and sub-units are the same as boys' schools. Locational requirements are similar to those of boys' elementary school. Site area for girls' elementary school is slightly small at present (M. E. Standards indicate a minimum site of 80m x 70m) and the rate of enrollment is also smaller than the rate for boys. The consultant, however, hesitates to recommend any smaller or lesser standards to girls' schools than boys' schools because of the urgent and strong necessity for girls' education in the kingdom.

#### A-2-1-4 INTERMEDIATE SCHOOL FOR BOYS

Age of Student:

12 through 14 (3.0 to 4.5% of total population; boys only)

Enrollment:

Close to 100% of age group population is enrolled, therefore 3.0% to 4.5% of the total population is enrolled (boys). Although M. E. Standards indicate that 5% of the total population is to be enrolled for boys intermediate schools.

Population Served:

15,000 is recommended. 10,000 to 20,000 is also accepted. (Even wider range is accepted if good planning reasons exist.)

Size of Facility:

600 enrollment per school (boys) is recommended. 300 to 900 enrollment per school is also acceptable. (M. E. Standards indicate 30 students/class x 15 classes/school = 450 student/school.)

Radius of Area Served:

Maximum 1200m (20 minute walking distance) is recommended. Larger radius is also accepted if density is less than 50 pph. In this case the acceptability standard should be provided on a case by case basis.

Sub-Unit:

25 to 30 students/class or homeroom (M. E. Standards recommend 30 students/classroom and 15 classrooms/school.)

Land Area Requirement:

20m<sup>2</sup>/student is recommended for the building and ground area. (20m<sup>2</sup>/student x 600 students = 1.2 ha) plus playfield which is either inside

	of the school site or closely located to it. (See "Standards for Playfield" - Level 1.) Minimum width of site is 80m with an acceptable building layout plan. (M. E. Standards recommend 100m x 100m but not less than 80m x 95m.)	Size of Facility:	600 enrollment per school (300 to 900) is recommended within the enrollment assumptions described above. (M. E. Standards indicate 30 students/classroom x 18 classrooms/school = 480 students/school.)
Floor Area Requirement:	6.5m <sup>2</sup> /student, i.e. 3900m <sup>2</sup> /600 students, is recommended. 5m <sup>2</sup> /student to 8m <sup>2</sup> /student is also acceptable depending on the degree of non-classroom facility (library, indoor sports) programs.	Radius of Area Served:	Maximum 1600m (25 minute walking distance) is recommended. Larger radius is also acceptable if density is less than 50 pph. In this case the acceptability standard should be provided on a case by case basis.
Location:	It should be situated in the center of grouping Level 3, i.e., "Sub-Community". It should be accessible either by footpath, lanes, alleys (V <sub>7</sub> ), local access street (V <sub>6</sub> ) or distributor road (V <sub>5</sub> ) with sidewalks (See definition of V <sub>7</sub> through V <sub>5</sub> in the "Road Standard" section) It should be separated from girls' school.	Sub-Unit:	25 to 30 student/class (M. E. Standards recommend 30 students/class and 18 classes/school.)
Other Requirements:	Playfield - Level 1 should be a part of or close to the school; it shall be used for intermediate school curriculum and also by the neighboring population for weekend and off-working-hour sports activities.	Land Area Requirement:	25m <sup>2</sup> /student is recommended for building and ground area (25m <sup>2</sup> /student x 600 student = 1.5 ha). In addition to the building, the playfield should be provided next to or close to the school. (See "Standards for Playfield" - Level 2.) Minimum width of site is 95m, but it could be less than that if acceptable building layout plans are provided. (M. E. Standards recommend 100m x 100m but not less than 95m x 110m.)
A-2-1-5 INTERMEDIATE SCHOOL FOR GIRLS	Age of population, population served, radius of area served, and sub-unit standards are the same as intermediate school for boys. Although the standards for girls' school are inferior at the moment, it is recommended that 100% enrollment up to intermediate school be mandatory not only for boys but also for girls. From this view point the standards for girls' school should be basically identical.	Floor Area Requirement:	7m <sup>2</sup> /student, i.e. 4200m <sup>2</sup> /600 students is recommended. 6m <sup>2</sup> /student to 8m <sup>2</sup> /student is also acceptable depending on the degree of provision of non-classroom facility (such as indoor athletic facilities) programs.
A-2-1-6 SECONDARY SCHOOL FOR BOYS	Age of Student: 15 through 17 (3 to 4.5% of total population; boys only).	Location:	It should be situated in the center of grouping Level 4, i.e. "Community". It should be accessible by either footpath, lanes, alleys (V <sub>7</sub> ), local access street (V <sub>6</sub> ), distributor road (V <sub>5</sub> ) or minor collector road (V <sub>4</sub> ). It should not be directly accessible from the residential area through arterial road (V <sub>2</sub> or V <sub>1</sub> ). (See section on "Road Standard" for the definition of V <sub>7</sub> through V <sub>1</sub> ) It should be separated from secondary schools for girls.
	Enrollment Assumptions: 37.5% of the age group served is assumed to be enrolled (boys enrollment is assumed 50%, girls' enrollment is assumed 30%). Therefore, 1.50 to 2.25% of total population is assumed to be enrolled for boys' secondary schools. M. E. Standards estimate that 2.5% of total population is enrolled for boys' secondary schools.	Other Requirements:	Playfield - Level 2 should be a part of or close to the school. It shall be used by secondary school curriculum by the neighboring population of "Community" for weekend and off-working hour sports activities.
	Population Served: 30,000 is recommended. 20,000 to 40,000 is also acceptable. (Even wider range is acceptable if good reasons exist.)	A-2-1-7 SECONDARY SCHOOL FOR GIRLS	Age of population, population served, radius of area served and sub-unit standards are the same as those of secondary school for boys. Enrollment assumptions should be lower than the case for boys. The enrollment of girl students should in the future go higher and eventually as high as the boys. For the present planning purposes, it is assumed that 30% of the girls' will

be enrolled in the secondary school (instead of 50% for boys). 30% of age group means 0.9% to 3.16% of the total population is enrolled in a girls' secondary school.

#### A-2-1-8 TEACHERS' SCHOOL

Age of Student: Varies

Enrollment and Size of Faculty: M. E. Standards recommend 30 students/class x 24 classrooms/school = 720 students/school.

Population Served/ Radius of Area Served: One Teachers' School for each city with population over 20,000.

Sub-Unit: 25 to 30 students/class.

Land Area Requirement: 30m<sup>2</sup>/student (2.1ha/720 students) (M.E. Standards require 100m x 100m for building and site area)

Floor Area Requirement: 8m<sup>2</sup>/student

Location: Directly accessible from the town center or from an arterial road leading to the town center.

Other Requirement: When college is established, the Teachers' School can be absorbed into it. Athletic field should be easily accessible.

#### A-2-1-9 TECHNICAL SCHOOL

Age of Student: Varies but over 15.

Enrollment and Size of Faculty: M. E. Standards recommend 30 students/class x 24 classes/school = 720 students/school.

Population Served/ Radius of Area Served: One technical school for each city with population of 20,000 or more.

Sub-Units: 25 to 30 students/class.

Land Area Requirement: 30m<sup>2</sup>/student (2.1ha/720 students.)

Floor Area Requirement: 8m<sup>2</sup>/student. (M. E. Standards require 100m x 110m for building and site area)

Location: Directly accessible to the town center or accessible from an arterial road leading to the town center.

#### A-2-1-10 TECHNICAL SCHOOL FOR GIRLS INCLUDING SEWING LEARNING PROGRAM

Age of Student: Varies but over 15.

Population Served/ Radius of Area Served: One female technical school for each city with population of 20,000 or more.

Land Area Requirement: 1 ha recommended. Minimum 80m x 70m.

Floor Area Requirement: 7m<sup>2</sup>/student.

Location: Accessible from the city center or from an arterial road leading to the center.

#### A-2-1-11 COLLEGES

Age of Student: 18 to 21 or 18 to 19.

Population Served: The first college at Abha by 1980. By 1995, Jizan, Khamis Mushayt and Najran will also have one college each.

Size of Facility: Average size of 1,000 students.

Land Area Requirement: 100m<sup>2</sup>/student to 50m<sup>2</sup>/student.

Floor Area Requirement: 15m<sup>2</sup>/student excluding dormitory facilities. (If dormitory is needed then 25m<sup>2</sup>/dormitory resident is additionally needed.)

Location: Accessible from the city center through arterial road. Locate as closely as possible to the city's central cultural area so that cultural-educational facility of the college is shared by the community.

#### A-2-1-12 SPECIAL COLLEGE

Age of Student: 18 to 21 or 18 to 19.

Population Served: The first special college (for medicine, agriculture and engineering) at Abha by 1995 serving the regional population.

Size of Facility: Average size of 600.

Land Area Requirement: 100m<sup>2</sup>/student excluding dormitory facilities.

Location: Located on regional arterial road or major arterial road connecting to and situated close to the city center.

A-2-2 PLANNING STANDARDS FOR RECREATIONAL AND ATHLETIC FACILITIES

A-2-2-1 TOT-LOT

Main Population: Pre-school children 2 years old to 5 years old and their supervising adults (mothers).

Main Function: Infants' exterior play, supervising adults' seating, conversation, and evening stroll.

Size of Population Served: Approximately 250. 12 to 16% of the total population, i.e. 30 to 40 is in ages 2 through 5.

Radius of Area Served: Maximum 120m (2 minute walking distance) is recommended. If density is less than 50 pph, 300m (5 minute walking distance) is acceptable.

Land Area Requirement: 500m<sup>2</sup>/lot is recommended. 300m<sup>2</sup> to 1000m<sup>2</sup>/lot is also acceptable.

Location: Situated in the center of each residential group unit (or grouping level of G<sub>0</sub> as defined in A-1-4) directly accessible from each unit without crossing any street or preferably even group parking spaces or access lane. It should be bordered by residential units or pedestrian activities but not by parking or streets.

Other Requirement: Infant play area and seating area should be arranged in such a way as to enable adult surveillance over the infants at play. Enough planting and shaded area should be provided. Play area should be visible from as many dwelling units as possible for the adults in house to survey their children at play in the tot-lot. Connected to the nearest nursery-kindergarten playlot by footpath through narrow but well controlled exit point.

A-2-2-2 NURSERY-KINDERGARTEN PLAYLOT

Main Population Served: 3 to 5 year old children enrolled in nursery-kindergarten. It also serves surrounding infants, accompanied by adults, and lower grade

elementary school children during off-school hours.

Main Function: For nursery-kindergarten outdoor play or for organized group play for pre-school children.

Size of Population Served: Approximately 1,000 inhabitants. 2.25% to 6% of the total population is enrolled in the nursery-kindergarten (See "Standards for Nursery-Kindergarten" in the previous section).

Radius of Area Served: Maximum 200m (3 minute walking distance) is recommended. 600m (10 minute walking distance) is also acceptable if density is less than 50 pph.

Land Area Requirement: 2000m<sup>2</sup> is recommended. 1000m<sup>2</sup> to 3000m<sup>2</sup> is also acceptable.

Location: Situated in the center of "Sub-Neighborhood" (See "Nursery-Kindergarten Standards".)

Other Requirement: Integral part of kindergarten design. Footpath connection to surrounding small scale tot-lots should be provided. Should not be bordered by major traffic. If bordered by any auto traffic, fences should be provided. Play pool for children may be included.

A-2-2-3 NEIGHBORHOOD PARK

Population Served: All inhabitants in the "Neighborhood", all age groups.

Main Function: General recreation. Preservation of natural environment in the neighborhood. Common garden for neighborhood residents.

Size of Population Served: 3,750, say 4,000, is recommended. 2,500 to 5,000 is accepted.

Radius of Area Served: Maximum 300m (i.e. 5 minute walking distance) is recommended. 600m (10 minute) is also acceptable. If density is less than 50 pph and access path to the park is designed over a long distance and properly separated from auto traffic, then radius may be extended.

Land Area Requirement: 5m<sup>2</sup>/inhabitant is recommended; 2m<sup>2</sup> to 10m<sup>2</sup>/inhabitant is also acceptable.

Location: Situated in the center of "Neighborhood" (grouping Level G<sub>2</sub>). Should not be surrounded or bordered by major traffic (street classification of "collector road" or higher).

Other Requirement: Connected to major neighborhood level facilities (such as elementary school, neighborhood shopping, small mosque, etc.) by footpath without crossing major traffic. Park itself could be stretched along such a path to create a linear park along which neighborhood facilities can be clustered. Trees, green areas, seating areas with benches and paved paths should be provided. Recreational adult swimming pool with ancillary facilities may be provided.

#### A-2-2-4 PLAYGROUND

Main Population Served: Primarily elementary school children at school time. Secondly other inhabitants at off-school-hours and weekends.

Main Function: Active play and game for elementary school athletic programs.

Size of Population Served: 3,750, say 4,000, is recommended. 2,500 to 5,000 is acceptable. 750 children (400 to 1,100 in range) per playground are expected, of which half are boys. Boys' and girls' playground are separated and each should be located in or close to the school.

Radius of Area Served: Maximum of 300m (i.e. 5 minute walking distance) is recommended. 600m (10 minute walking distance) is also acceptable. When density is less than 50 pph, longer service radius is acceptable if safe and pleasant access to the playground is provided.

Land Area Requirement:  $20m^2$ /elementary school student is recommended.  $10m^2$  to  $30m^2$ /elem. school student is acceptable.

Location: Situated at the center of the "Neighborhood" (See "Elementary School Standards"). Situated in convenient proximity to both boys' and girls' elementary schools.

Other Requirement: Designed as an integral part of an elementary school. Connected to the elementary school and residential zone on footpath crossing no major traffic. Off-school time usage by the adult population is recommended and elementary school utilities such as water-drinking and toilet should be available for those adults. Enough pavement space should be provided for medium size sports activities such as basketball, tennis, etc. Childrens' pool, fenced and equipped with locker room and shower can be provided as a part of the playground program or a part of school program.

#### A-2-2-5 COMMUNITY PARK OR SMALL CITY PARK

Population Served: All residents of the "Community" whose population range is 20,000 to 40,000 (30,000 as average).

Main Function: Passive recreation on a weekly to monthly participation basis (not daily use) to be integrated with cultural, religious facilities. It also functions as a linear connector of "Community" level facilities.

Size of Population Served: 30,000 is recommended. 20,000 to 40,000 is acceptable.

Radius of Area Served: Maximum 1000m (15 minute walking distance) is recommended. 1600m (20 minute) is also acceptable. When density is less than 50 pph, longer service radius may be acceptable if the park penetrates into the residential zones as a linear park to provide safe and pleasant footpath to the center of the park.

Land Area Requirement:  $4m^2$ /inhabitant is recommended.  $2m^2$  to  $6m^2$ /inhabitant is acceptable.

Location: Situated in the center of a "Community" whose population range is 20,000 to 40,000. It should be located between two sub-community centers in order to connect them and to create a park-open space spine in the middle of which the "Community" center is located.

Other Requirement: Fruit trees or agricultural land use could be used as a part of community park function since a part of the function is as visual relief or visual buffer between two adjacent subcommunities. Where community park comes in contact with community commercial (or shopping) area, the park design should reflect an "urban park" where extensive pavement and landscaping are concentrated in a limited area.

#### A-2-2-6 PLAYFIELD - LEVEL 1

Main Population Served: Primarily for intermediate school students at school hour; secondarily, for other inhabitants in the "Sub-Community" at off-school-hours or weekends.

Main Function: For athletic curriculum activities of intermediate schools (boys and girls). Practice field for "Sub-Community" sports club or sports team activity.

Size of Population Served: 15,000 is recommended. 10,000 to 20,000 is acceptable. 600 to 1800 intermediate school enrollment (boys plus girls) is assumed in the service area.

Radius of Area Served: Maximum 1200m (20 minute walking distance) is recommended. When density is less than 50 pph, longer radius is acceptable if bus service is provided the areas beyond the recommended walking distance.

Land Area Requirement: 30m<sup>2</sup>/intermediate school student is recommended. 20m<sup>2</sup> to 40m<sup>2</sup>/student is accepted.

Location: Situated at the center of a "Sub-Community", whose population range is 10,000 to 20,000, and in close proximity to or in integrated part of both boys' and girls' intermediate schools.

Other Requirement: Parking space should be provided for the adult field users (10 to 20 spaces). Official pavement sizes for game courts should be provided for sports requiring smaller spaces, such as tennis and basketball, but not necessarily full size official dimensions for the field and track. Boys' and girls' fields should be separated with enough distance. Swimming pool(s) can be provided with shower rooms and locker rooms.

#### A-2-2-7 PLAYFIELD - LEVEL 2

Main Population Served: Primarily for secondary school students at school hour; secondarily for the other residents in the "Community" off-school-hours or weekends.

Main Function: For athletic curriculum activity of secondary schools (boys and girls separately). Practice and competition or game for the community sports teams and clubs.

Size of Population Served: 30,000 is recommended. 20,000 to 40,000 is acceptable. 900 (450 to 1350) students per playfield are expected, 70% of whom are boys.

Radius of Area Served: Maximum 1000m (15 minute walking distance) is recommended; 1600m (20 minute) is also acceptable. When density is less than 50 pph, longer service radius may be acceptable if bus system and pleasant pedestrian path are provided to cover the "Community" and if ample parking space is provided.

Land Area Requirement: 50m<sup>2</sup>/secondary school student. 40m<sup>2</sup> to 60m<sup>2</sup>/student is also acceptable. Minimum land area is 4ha/playfield.

Location: Situated at the center of a "Community" whose population range is 20,000 to 40,000 and in close proximity to both boys' and girls' secondary schools.

Other Requirement: Parking space should be provided for the adult field users and game spectators. Full size official dimensions for courts, track and fields. Simplified spectator seating area, either by stands or by banking should be provided. Boys' and girls' playfields should be separated with enough distance. Swimming pool with full official size can be provided with full ancillary activities (indoor and outdoor).

#### A-2-2-8 CITY PARK

Population Served: All residents and non-resident workers of a city with a population of 60,000 or more.

Main Function: Weekend family recreation for residents. Lunch time recreation for downtown workers. Park as an integral part of city's cultural and recreational center.

Size of Population Served: 40,000 or more. In 1995 all five cities with the exception of Bishah and Najran should have a "city park". Bishah and Najran will have a "Community Park" functioning as a "small scale city park".

Radius of Area Served: Entire city. Radius varies.

Land Area Requirement: 4m<sup>2</sup>/inhabitant is recommended. 2m<sup>2</sup> to 6m<sup>2</sup>/inhabitant is acceptable.

Location: Situated at the center of city with main cultural, community, and educational functions clustered around it.

Other Requirement: Historical district and architecture are to be integrated into the network of a city park. The park is conceived as a combination of a central park and its extended network to which the lower hierarchical park network is connected. Arena (enabling indoor sports, exhibition, theater, musical festival and other multi-purpose uses) should be integrated in the city park site.



A-2-3 PLANNING STANDARDS FOR  
RELIGIOUS FACILITIES

A-2-3-1 SMALL MOSQUE

Population Served:	75% to 100% of the adult male in the age group 15 and above (i.e. approximately 20% to 25% of the total population potentially attends one of the mosques in the city.
Size of Population Served:	One neighborhood mosque (small mosque) for every 3,750 inhabitants (potential attendance 800 to 1000 persons) is recommended. 2500 to 5000 inhabitants (500 to 1250 prayers) is acceptable.
Radius of Area Served:	Maximum 200m (i.e. 3 minute walking distance) is recommended. 600m (10 minute walking distance) is also acceptable.
Land Area Requirement:	0.2 to 0.3 ha/mosque.
Floor Area Requirement:	1.2m <sup>2</sup> /person, i.e. 600m <sup>2</sup> to 1500m <sup>2</sup> .
Location:	Situated at the center of a "Neighborhood" with population of approximately 2500 to 5000.
Other Requirement:	Elementary school and neighborhood cultural facilities should be closely linked to the mosque to foster an integration of religious and educational functions.

A-2-3-2 JAMI'A MOSQUE

Population Served:	10% of the inhabitants of the service area.
Size of Population Served:	One Jami'a Mosque for each 15,000 inhabitants (i.e. approximately 1500 prayers) is recommended. 10,000 to 20,000 inhabitant range is also accepted (i.e. 1000 to 2000 prayers).
Radius of Area Served:	Maximum 1200m (20 minute walking distance) is recommended. Larger radius may be acceptable if density is less than 50 pph. In this case standards should be provided on a case by case basis.
Land Area Requirement:	0.6 to 0.8ha/mosque.
Floor Area Requirement:	1.2m <sup>2</sup> /prayer (i.e. 1200 to 2400m <sup>2</sup> /mosque) is recommended.

Location:

Situated at the center of a "Sub-Community" with a population of 10,000 to 20,000.

Other Requirement:

Intermediate schools should be close to the mosque in order to foster an integration of religious and educational functions.

A-2-3-3 Eid Mosque

Population Served:

1 to 2% of the population in the served area; 20 to 25% of the total population should be included for the determination of land area.

Size of Population Served:

One for every 100,000 to 300,000 population. Therefore none of the cities in the southern region can justify an Eid Mosque due to a lack of population. Abha and Khamis Mushayt's combined population in 1995 is estimated to be 151,000 and will together require one Eid Mosque.

Radius of Area Served:

Not specified.

Land Area Requirement:

0.6m<sup>2</sup>/prayer, i.e. 1.2 ha to 3.6ha/unit is recommended.

Other Requirement:

The mosque is a fenced open area; it is provided with a guard room and a storage.

A-2-4 PLANNING STANDARDS FOR  
SOCIAL AND CULTURAL  
ACTIVITIES

A-2-4-1 NEIGHBORHOOD CENTER

Size of Population Served:

3,750 (say 4,000) is recommended. 2,500 to 5,000 is acceptable.

Main function:

General social interactions (meetings, elementary school PTA, games). Offices for a neighborhood association to program activities, maintenance, and utilization of parks and facilities. Supervision and coordination of sub-neighborhood activity and facilities. Adult education associated with elementary school facilities and small mosque activities (including a neighborhood library).

Radius of Area Served:

Maximum 300m (i.e. 5 minute walking distance) is recommended. 600m (10 minute) is also acceptable.

If density is less than 50 pph, maximum radius may be increased depending on the local condition.

**Land Area** 0.1 to 0.5ha/center. If the center abutts a neighborhood park and the park is directly accessible from the center, less than 0.1 ha is acceptable.

**Floor Area Requirement:** 0.05m<sup>2</sup>/inhabitant (i.e. 125m<sup>2</sup> to 250m<sup>2</sup>) is recommended. 0.03 to 0.1m<sup>2</sup>/inhabitant is also acceptable.

**Location:** Situated at the center of a "Neighborhood" whose population is in the range of 2,500 to 5,000. Close to the neighborhood park, playground, small mosque, and neighborhood shopping area.

**Other Requirement:** Courtyards and other small scale exterior spaces for seating and visual relief should be provided. Footpath access from surrounding residential area without crossing any major traffic.

#### A-2-4-2 COMMUNITY CENTER

**Size of Population Served:** 30,000 is recommended. 20,000 to 40,000 is acceptable; even wider range is acceptable if good reasons exist.

**Main Function:** General social interactions for residents in the "Community" (meetings, adult education, social ceremonies, entertainment, cultural activity programs, PTA for intermediate and secondary schools). Offices for a community association to program activities for maintenance and utilization of community parks, community facilities, intermediate and high school facilities and playfields.

**Radius of Area Served:** Maximum 1600m (25 minute walking distance) is recommended. Even larger radius is accepted if density is less than 50 pph, depending on the situation.

**Land Area Requirement:** 0.2 to 1.0ha/center is recommended. If the center abuts a community park and direct access to it is available, less than 0.2 ha is also acceptable. In any case 0.1 ha is the minimum.

**Floor Area Requirement:** 0.01m<sup>2</sup>/inhabitant (i.e. 200m<sup>2</sup> to 400m<sup>2</sup>) is recommended. 0.005m<sup>2</sup> to 0.02m<sup>2</sup>/inhabitant is also acceptable.

**Location:** Situated at the center of a "Community" whose population range is 20,000 to 40,000. Close to

the community park, community shopping center, Jami'a Mosque, secondary school community museum, library, youth center (these could be a part of the community center) and playfield, Level 2.

**Other Requirement:** Additional standards for potential components of community center:  
 a. Community library: One for each 30,000 inhabitants (20,000 to 40,000). Land area 0.1m<sup>2</sup>/inhabitant if library is in an independent building and not a part of community building. If the library is located in the community center, the land area is increased by 0.05m<sup>2</sup>/inhabitant from the community center building land requirement. Floor area is 0.01m<sup>2</sup>/inhabitant.  
 b. Community museum: Standard is identical to that of community library with the exception of museums located in a renovated old structure. In such a case, standards should be created on a case by case basis.

#### A-2-4-3 CIVIC CENTER

**Size of Population Served:** 60,000 and over. One center for every city.

**Main Function:** Cultural and social center for the city. Art gallery, exhibition hall, small arena, museum and auditorium are included.

**Radius of Area Served:** Entire city and its vicinity. Radius varies.

**Land Area Requirement:** 0.5m<sup>2</sup>/inhabitant (i.e. 3ha/60,000 inhabitants) or more. If the Civic Center is designed as an integral part of other downtown activities such as commercial areas, the land area requirement can be reduced to 0.25m<sup>2</sup>/inhabitant.

**Floor Area Requirement:** 0.05m<sup>2</sup>/inhabitant (i.e. 300m<sup>2</sup>/60,000 inhabitants) is recommended, including art gallery, exhibition hall, arena-auditorium (these facilities can be put in one structure or in separate buildings) and other general and multi-purpose rooms.

**Location:** Situated at the center of city with a population of 60,000 or over. Closely located to the administration-commercial center of the city and city park system.

**Other Requirement:** Pedestrian zone should be clearly defined, eliminating auto traffic and providing in the city a pedestrian island of which the Civic Center is a core. Downtown historical artifacts should be preserved and maintained as a part of a Civic

Center-city park complex.

#### A-2-5 PLANNING STANDARDS FOR HEALTH FACILITIES

##### A-2-5-1 PHARMACY

Size of Population Served: One general practitioner and/or pharmacy for every neighborhood of population size 2,500 to 5,000.

Main Function: Outdoor treatment, diagnosis, and general treatment. Providing hospital information to the residents. Providing patient information to the community clinic and higher level hospitals.

Radius of Area Served: Maximum 300m (i.e. 5 minutes walking distance) is recommended. 600m (10 minute) is also acceptable.

Land Area Requirement: 0.1ha/unit approximately.

Floor Area Requirement: 0.05m<sup>2</sup>/inhabitant or more.

Location: Situated at the center of a "Neighborhood". Access by footpath without crossing major traffic.

##### A-2-5+2 SUB-COMMUNITY DIAGNOSIS AND TREATMENT CENTER (INCLUDING RED CRESENT BUILDING)

Size of Population Served: One for 15,000 (10,000 to 20,000 more or less) inhabitants.

Main Function: Public health centers for general treatment and diagnosis and for red crescent program.

Radius of Area Served: Maximum 1200m (20 minute walking distance) is recommended. Larger radius may be acceptable when density is less than 50 pph.

Land Area Requirement: 0.3m<sup>2</sup>/inhabitant (i.e. 0.3ha to 0.6ha/center) is recommended.

Floor Area Requirement: 0.05m<sup>2</sup>/inhabitant (i.e. 500m<sup>2</sup> to 1000m<sup>2</sup>/center) or more is recommended.

Location: Situated at the center of a "Sub-Community" with a population of 10,000 to 20,000.

##### A-2-5-3 COMMUNITY/GENERAL HOSPITAL

Size of Population Served: One for each city with a population over 30,000 more or less.

Main Function: General hospital for normal treatment clinics, diagnosis and treatment, long term care, public health, nursing units, and emergency and firstaid.

Radius of Area Served: Varies. The hospital serves not only the city population but also the surrounding suburban population.

Land Area Requirement: 0.5m<sup>2</sup> to 1.0m<sup>2</sup>/inhabitant is recommended (i.e. 2.5 ha to 5ha/hospital for a city with 50,000 inhabitants).

Floor Area Requirement: 3 to 4 beds/1,000 inhabitants is recommended. 20 to 40m<sup>2</sup>/bed is recommended. (i.e. 3000m<sup>2</sup> to 8000m<sup>2</sup>/hospital for a city with 50,000 inhabitants.) 200 to 500 beds/hospital is generally recommended.

Location: Close to the center of the city yet easily accessible from the main arterial and regional road for easy emergency access and easy access for the suburban population. Psychological, visual, and accoustical relief should be secured by not locating in the middle of the built-up areas.

##### A-2-5-4 SPECIAL HOSPITALS AND NURSING HOME

Size of Population Served: One mental hospital for each 50,000 inhabitants or more. One special long term hospital for each 50,000 inhabitants or more. One nursing home for each 50,000 inhabitants or more.

Land Area Requirements: 0.1ha/1000 inhabitants for mental hospital or long term hospital. 0.02ha/1000 inhabitants for nursing home.

Floor Area Requirement: 5 beds/1000 inhabitants, and 20m<sup>2</sup> to 45m<sup>2</sup>/bed (mental hospital). 3beds/1000 inhabitants, and 20m<sup>2</sup> to 45m<sup>2</sup>/bed (special long term hospital). 1 to 2beds/1000 inhabitants, and 20m<sup>2</sup> to 45m<sup>2</sup>/bed (nursing home).

Table A-2-1  
SPECIAL HOSPITAL REQUIREMENT IN SOUTHERN REGION  
(PRESENTLY IDENTIFIED BY THE MINISTRY OF HEALTH)

	ASIR	JIZAN	BISHAH	NAJRAN	TIHAMA
CHEST DISEASE	1*	0	0	0	0
OBSTETRICS AND GYNECOLOGY	2	1	1	1	2
OPHTHALMOLOGY & OTOLARYGOLOGY	1	0	0	0	0
HOSPITAL FOR ACCIDENT	2	1	1	1	1
FEVER (COMMUNICABLE)	1*	1	0	0	0
PSYCHIATRY	1	0	0	0	0
LEPROSY	0	1	0	0	0
TOTAL	8	4	2	2	4

NOTE: \* Existing Al-Asan Hospital is for both chest disease and other communicable (fever) diseases. In future, the fever hospital will be separated to the new location.

Table A-2-2  
DOCTOR REQUIREMENT

1 General doctor for 40-50 patients
1 Special doctor for 10-15 patients
1 nurse for 4-6 patients

A-2-6 PLANNING STANDARDS FOR  
COMMERCIAL FACILITIES

A-2-6-1 NEIGHBORHOOD SHOP-  
PING CENTER

Size of Population Served: 4,000 inhabitants more or less. (2,500 to 5,000.)

Main Functions: Food market, drugstore, bakery, barber shop, laundry and dry cleaning, hardware, stationery, restaurant, etc.

Radius of Area Served: Maximum of 300m (i.e. 5 minute walking distance) is recommended. 600m (10 minute) is also acceptable. If density is less than 50 pph, a larger radius may be acceptable depending on the situation.

Land Area Requirement: 2 to 4m<sup>2</sup>/inhabitant, i.e. 0.8 ha to 1.6ha/4000 inhabitants.

Floor Area Requirement (Sales Area): 0.25 to 0.5m<sup>2</sup>/inhabitant (i.e. 1000m<sup>2</sup> to 2000m<sup>2</sup>/4000 inhabitants) is recommended.

Location: Situated at the center of neighborhood with population size of 2,500 to 5,000 or along the local distributor road connecting the center of the neighborhood to the "Sub-Community" with a population of 10,000 to 20,000. Closely located to or integrated with neighborhood center, neighborhood park and other neighborhood facilities.

Other Requirement: If a shopping center for a higher hierarchical group order exists in the vicinity, the neighborhood shopping center is incorporated into the larger shopping center. A portion of neighborhood shopping center could be substituted by the corner stores in the neighborhood. 1:1 parking (i.e. parking area : sales area = 1:1) is recommended. Less than 1:1 is acceptable if density is more than 100 pph.

A-2-6-2 COMMUNITY SHOPPING  
CENTER

Size of Population Served: 30,000 inhabitants more or less.

Main Function: Basic retail service to the "Community" population. Shops whose financial viability requires larger population than neighborhood population are located in the community shopping center (such as florist, shoe shops, giftshops, candy, lingerie, book stores, toys, childrens' wear,

radio and TV repairs, etc). "Second Floor Office" could be included.

Radius of Area Served:

Maximum 1200m (20 minute walking distance) is recommended. Larger radius is also acceptable if density is less than 50 pph and ample parking space is provided.

Land Area Requirement:

0.5m<sup>2</sup> to 1.0m<sup>2</sup>/inhabitant is recommended. (i.e. 1.5 ha to 3ha/30,000 inhabitants.)

Floor Area Requirement (Sales Area):

0.1m<sup>2</sup> to 0.2m<sup>2</sup>/inhabitant (i.e. 3000m<sup>2</sup> to 6000m<sup>2</sup>/30,000 inhabitants) is recommended.

Location:

Situated at the center of community with population size of 20,000 to 40,000 or along the arterial road connecting community center to city center. Close to or integrated with community center, park and other community facilities.

Other Requirement:

When a regional shopping center or a downtown shopping center is in the vicinity, the community shopping center may be incorporated into the larger shopping center. 2:1 parking (i.e. parking area : sales area = 2:1). Less than 2:1 is acceptable if density is more than 100 pph.

#### A-2-6-3 SUB-REGIONAL SHOPPING CENTER

Size of Population Served:

100,000 inhabitants or more.

Main Function:

Downtown shopping center to serve the regional population. This could also be located along a major arterial extending from the city center. It will provide, in addition to the stores normally found in the neighborhood and community shopping centers, fashion goods, furniture, household equipment, women's apparel, etc.

Radius of Area Served:

City and its neighboring communities. Regional population beyond city and its surroundings also uses on a less frequent basis.

Land Area Requirement:

0.5m<sup>2</sup> to 1.0m<sup>2</sup>/inhabitant (i.e. 5 ha to 10ha/100,000 inhabitants) is recommended.

Floor Area Requirement (Sales Area):

0.1m<sup>2</sup> to 0.2m<sup>2</sup>/inhabitant (i.e. 10,000m<sup>2</sup> to 20,000m<sup>2</sup>/100,000 inhabitants) is recommended.

The following table indicates per capita sales areas for different sizes of the city popula-

tion (including neighborhood, community and regional shopping centers):

Table A-2-6-1  
SALES AREA PER CAPITA

CITY POPULATION	COMPONENTS(m <sup>2</sup> /inh.)	TOTAL(m <sup>2</sup> /inh.)
4,000	0.25 to 0.5	0.25 to 0.5
30,000	0.25 to 0.5 plus 0.1 to 0.2	0.35 to 0.7
100,000	0.25 to 0.5 plus 0.1 to 0.2 plus 0.1 to 0.2	0.45 to 0.9

Building area is about 1.5 times the floor area.

Location:

Situated in the downtown area of major cities or along the regional arterials leading to the major city centers.

Other Requirement:

4:1 parking is recommended. 2:1 is also acceptable if located in the middle of downtown.

#### A-2-7 PLANNING STANDARDS FOR PUBLIC BUILDINGS

##### A-2-7-1 FIRE STATION

Population Served:

One for each community of population of 20,000 to 40,000 inhabitants.

Radius of Area Served:

In a high value district:  
a. Maximum 1.5 km for engine companies.  
b. Maximum 2.0 km for ladder companies.  
In a normal residential district:  
a. Maximum 3.0 km for engine companies.  
b. Maximum 5.0 km for ladder companies.  
In a high density residential district:  
a. Maximum 2.5 km for engine companies.  
b. Maximum 3.5 km for ladder companies.

Land Area Requirement:

Approximately 10m<sup>2</sup>/1000 inhabitants is recommended.

Floor Area Requirement:

3m<sup>2</sup>/1000 inhabitants is recommended.

Location:

In residential district, station should be located to the center. Additional stations

should be near extensive industrial or business districts and near districts where there is a high life hazard. An intersection of roads is a preferred station location.

Other Requirement: Water supply system with adequate pressure should be developed. Reserve capacity: 5-day reserve with maximum daily rate.

#### A-2-7-2 POST OFFICES

Population Served: One post office for each city. One branch post office for each neighborhood with a population of 2,500 to 5,000.

Radius of Area Served: Maximum 300m (5 minute walking distance) is recommended for branch office. 600m (10 minute) is also acceptable if density is less than 50 pph. A larger radius is acceptable depending on the situation.

Land Area Requirement: 0.2 ha to 0.4ha/city post office.

Floor Area Requirement:  $2m^2/1000$  (i.e.  $100m^2/50,000$  city). City post office should be located at city center. Branch post office should be located at the center of center of neighborhood with population range of 2,500 to 5,000. It can be located inside of the neighborhood center.

#### A-2-7-3 POLICE STATION

Population Served: One for each city with population over 50,000, i.e. at minimum a city of 50,000 inhabitants should have one police district with approximately 10 police. (1.5 to 2.0 police/1000 inhabitants.)

Radius of Area Served: 1000ha/district (1.8 km radius) or more at a density of 50 pph or less. At lower densities, service radius may be extended. Mobile unit is needed in any case.

Land Area Requirement: 0.2 to 0.4ha/district station.

Floor Area Requirement:  $2m^2/1000$  inhabitants (i.e.  $100m^2/50,000$  inhabitants).

Location: Situated in the center of town with comparable distances to different parts of its service population. Corner site is preferred for the convenience of the mobile unit.

#### A-2-7-4 GOVERNMENT OFFICES

Population Served: One for each city. The percentage of government employment to total population is in a range from 6% to 14% (at present the 5 city average is approximately 10%) of which it is assumed 3% to 7% (half) are in administrative sectors (excluding teachers, police, firemen, etc., who have normal place of work rather than offices), i.e. 2,500 to 3,750 are located in the administrative offices (for the case of a 50,000 city).

Floor Area Requirement: Assuming 80% gross efficiency and proper use of net areas, there should be  $10m^2$  to  $20m^2$ /employee (i.e.,  $25,000m^2$  to  $75,000m^2$  for city of 50,000). If FAR = 2, then land area is approximately 2.5 ha.

Location: Situated and concentrated in the center of town.

#### A-2-8 PLANNING STANDARDS FOR HOUSING AND DENSITY

Table A-2-8 shows the approximate ideas on the relationship between residential building types and residential densities. "Net residential density" defined as the ratio of the number of inhabitants to the total area inside the property boundary lines excluding street areas in the residential district. "Net neighborhood density" is ratio of the number of inhabitants to the net neighborhood area including amenities, schools, residential streets, and neighborhood services but excluding non-used reserve areas or areas devoted to facilities which serve community structure at a higher level than neighborhood. As shown in the right hand side of the Table, gross density for a neighborhood area varies from 15 pers./ha (for single family villa) to 252 pers./ha (for average equivalent of 10 story apartments). In reality, there is little possibility of having only single family villas or 10 story apartments in one neighborhood, exclusive of other types. It is estimated that actual, net neighborhood density in many cases is somewhere between 50 pers./ha to 200 pers./ha depending on the mixture of unit types.

As far as net residential density is concerned, it is estimated that the most probable case is in the vicinity of 150 to 200 pers./ha. For example, the combination of 10% standard villa (say  $750 m^2$  site/unit, 5 persons/unit) 60% smaller villa (say  $250 m^2$  site/unit, 5 persons/unit) and 30% multi-family units (say  $100 m^2$  site/unit, 5 persons/unit) results in approximately 150 to 200 pers./ha of net density.

A-2-9 PLANNING STANDARDS FOR ROAD AND WORK

A-3 APPLICABLE STANDARDS

A-3-1 A HYPOTHETICAL EXAMPLE

A-2-9 PLANNING STANDARDS FOR ROAD AND STREET NETWORK

Table A-2-9(a) shows the classification and standards for roads and streets. Clear recognition of the hierarchical order of the street network system is crucial to achieve group privacy in an automobile oriented society. The street network hierarchy should be integrated into the hierarchical order of facility distribution and territorial sequence to maximize the access convenience yet to minimize the potential hazard and nuisance caused by auto traffic in the residential area.

Diagram A-2-9(b) indicates typical sections for each type of road classified in Table A-2-9(a).

Diagrams A-2-9(c) and A-2-9(d) indicate general outlines for road intersections.

A-3 APPLICATION OF PLANNING STANDARDS

A-3-1 A HYPOTHETICAL EXAMPLE

Table A-3-1(a) shows an example of land area distribution based on the standards developed in the previous sections. In order to reflect the situation in the Southern Region in 1995, a hypothetical city of 60,000 inhabitants is analyzed. It is found that such a city will require approximately 1,140 ha, 750 ha or 550 ha with net residential densities of 100 pph, 200 pph, or 400 pph, respectively. (These densities correspond to net densities of "villa"; mixture of "villa" and "one family semi-detached"; and low-rise "multi-family", respectively, see Table A-2-8 column C).

Table A-3-1 (b) is based on the result of computation on Table A-3-1 (a). It shows the land distribution for each use in the hypothetical residential city of 60,000 inhabitants. It is assumed that such a city will have two "Communities" of 30,000 residents, each of which will have two "Sub-Communities" of 15,000 residents, each of

which, in turn, will have four "Neighborhoods" of 3,750 residents. Since this model does not take into consideration non-used or reserved area of the city, the percentages for the listed use per total "actual" city area should be less than those listed. The table, therefore, is a preliminary guide to the allocation of "used-land" to different uses.

A-3-2 HIERARCHICAL ORDER OF GROUPING

Figure A-3-1 shows an example layout of prototypical city in which the recommended standards are expressed as a diagram. This is merely one of many acceptable interpretations of the standards. It is not the consultants' intent to impose a fixed solution to the planning. Rather, this is just a demonstration of one example against which the planning concepts for each city may be evolved.

Table A-2-8  
RESIDENTIAL TYPES OF HOUSES AND DENSITIES

	A	B	C	D	E	F	G
	LAND AREA PER FAMILY m <sup>2</sup>	NET DWELLING DENSITY Fam./ha	NET DENSITY* Pers./ha	RATIO OF NET RESIDENT- TIAL DENSITY TO NET NEIGH- BORHOOD DENSITY**	NET NEIGH- BORHOOD DWELLING DENSITY Fam./ha	NET NEIGH- BORHOOD DENSITY Pers./ha	APPROX- IMATE AVERAGE NET NEIGH- BORHOOD DENSITY Pers/ha
(1) LARGE VILLA	4,000 2,000	2.5 5.0	12.5 25.0	80.9% 78.6%	2.0 3.9	10.1 19.7	15
(2) STANDARD VILLA	1,000 500	10.0 20.0	50.0 100.0	74.4% 67.2%	7.4 13.4	37.2 67.2	52
(3) 1 FAMILY SEMI-DETACHED OR SMALLER VILLA	300 200	33.3 50.0	166.5 250.0	59.5% 52.1%	19.8 26.1	99.1 130.3	115
(4) MULTI-FAMILY LOW-RISE (2 STORY)	150 125	66.7 80.0	333.5 400.0	46.3% 42.5%	30.9 34.0	154.4 170.0	162
(5) MULTI-FAMILY MID-RISE (3-5 STORY)	100 75	100.0 133.3	400.0 533.2	42.5% 36.6%	42.5 48.8	170.0 195.1	183
(6) MULTI-FAMILY HIGH-RISE (6-10 STORY)	50 25	200.0 400.0	800.0 1600.0	28.5% 17.2%	57.0 68.8	228.0 275.2	252

NOTE: \* 5 Pers./Fam. is assumed for building types (1) through (4);  
4 Pers./Fam. is assumed for building types (5) and (6).

\*\* -Net residential area:  
Net area is the area within residential property lines. The area for streets and area for neighborhood facilities are excluded from the net residential area. The population (or number of residential units) divided by this area is called "net residential population (or dwelling) density."

-Net neighborhood area:  
Net residential area defined above plus the area for streets (streets at the neighborhood scale) and area for neighborhood facilities is called net neighborhood area. The area for neighborhood buffer zone, area for facilities to serve higher levels of community hierarchy (such as, community shopping center and intermediate and high schools) and the areas for non-neighborhood scale streets (such as regional highways) are excluded from this "net neighborhood area". The population (or the number of dwelling units) divided by the "net neighborhood area" is called "net neighborhood population (or dwelling unit) density".

-Computation of column "D" is based on the following formula:

$$y = \frac{P}{(P+ax) \cdot (1+c)}$$

where:

y = ratio of net neighborhood density to net residential density

x = net residential density

P = typical population of neighborhood.

P = 3750 is assumed.

a = neighborhood facility area excluding circulation space (8.1 ha in table A-3-1 (a) as a total of (1) through (7); plus contingency of 10%, i.e., 8.1 x 1.1 = 9 ha).

a = 9 ha is assumed.

c = ratio of circulation space to net neighborhood area minus neighborhood circulation space.

c = 0.2 is assumed.

This formula is calculated in the following process:

$$x = \frac{P}{R} \text{ (where, R = net Residential Area)}$$

$$y = \frac{P/N}{P/R} = \frac{R}{N} \text{ (where, N = net Neighborhood Area)}$$

$$N = (R + a) \cdot (1+c)$$

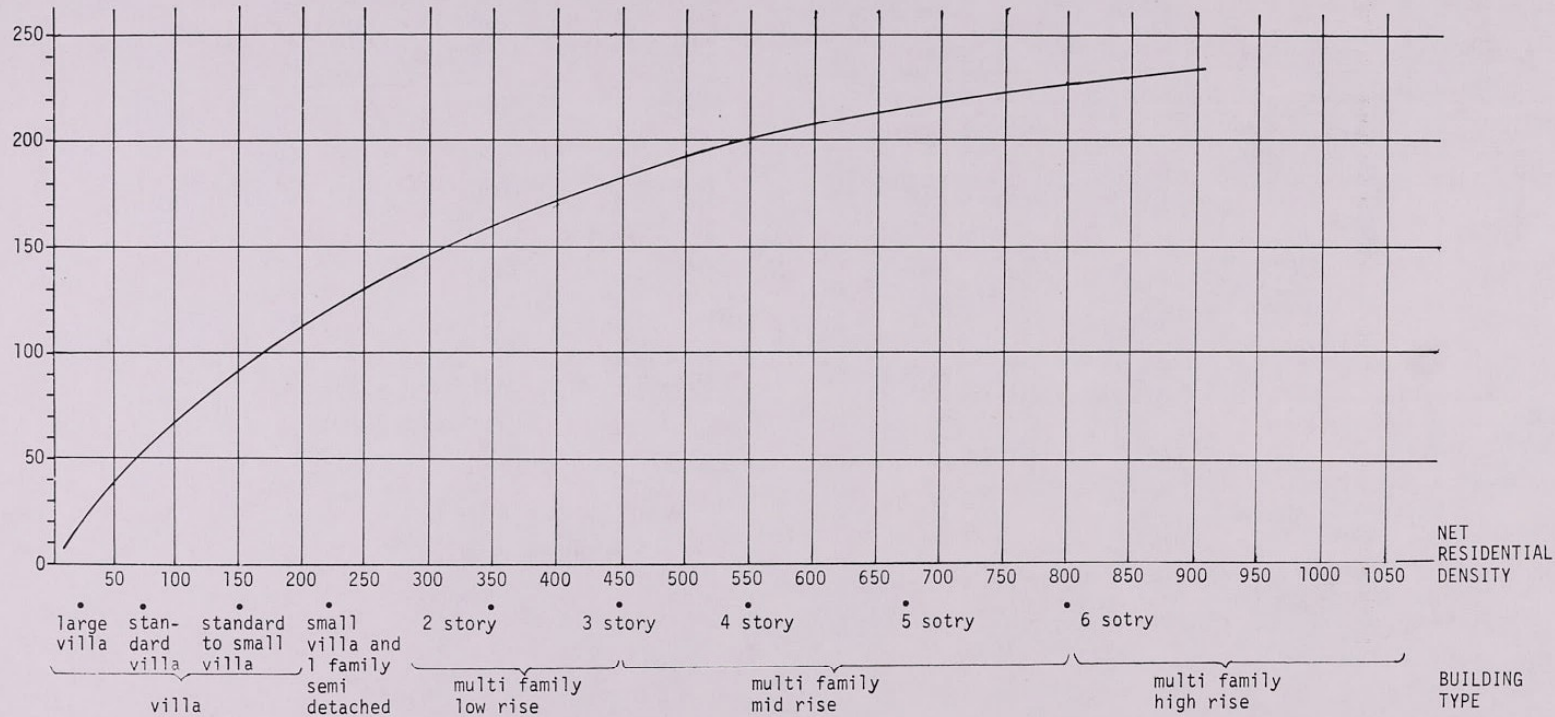
from above,

$$y = \frac{R}{(R+a) \cdot (1+c)} = \frac{P/x}{(P/x+a) \cdot (1+c)} = \frac{P}{(P+ax) \cdot (1+c)}$$



FIGURE A-2-8  
 RELATIONSHIP BETWEEN NET  
 RESIDENTIAL DENSITY AND  
 NET NEIGHBORHOOD DENSITY  
 AND  
 RELATIONSHIP BETWEEN NET  
 DENSITY AND BUILDING TYPE

NET NEIGHBORHOOD  
 DENSITY  
 (pers./ha)

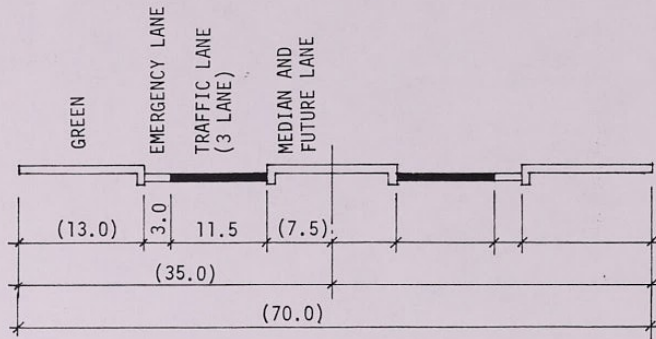


- NOTE: 1. The relation between net neighborhood density and net residential density shown here is based on the discussion developed in the Section A-2-8 and Table A-2-8. It shows one "example case" and not necessarily always true. Actual relationship is depending on detail planning and design of the neighborhood. The figure is shown here for the purpose of providing "approximate example idea" of the relationship between the two densities.
2. Actual relation between net residential density and building type is depending upon the dwelling unit size, family size and many other conditions.

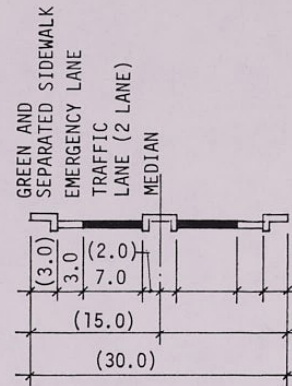
Table A-2-9(a)  
CHARACTERISTICS AND HIERARCHY OF ROADS AND STREETS (RECOMMENDATION ONLY)

SYSTEM CLASSIFICATION	PRIMARY ROAD SYSTEM			LOCAL ROAD SYSTEM			
		SECONDARY ROAD SYSTEM					
FUNCTIONAL CLASSIFICATION	V <sub>1</sub> REGIONAL HIGHWAY	V <sub>2</sub> MAJOR ARTERIAL	V <sub>3</sub> ARTERIAL	V <sub>4</sub> COLLECTOR	V <sub>5</sub> DISTRIBUTOR	V <sub>6</sub> LOCAL ACCESS ROAD	V <sub>7</sub> SERVICE ROAD
	LONG TRIPS: NATIONAL AND REGIONAL TRIP	MEDIUM TRIPS: INTER-SETTLEMENT TRAVEL	MEDIUM TRIPS: INTER TO INTRA-SETTLEMENT TRAVEL	MEDIUM TO SHORT TRIPS: INTRA-SETTLEMENT TRAVEL	SHORT TRIPS: INTRA-SETTLEMENT TRAVEL ONLY	VERY SHORT TRIPS: INTRA-SETTLEMENT TRAVEL ONLY	SERVICE ACCESS TO PROPERTIES
ACCESS CONTROL	FULL CONTROL	CONTROL	PARTIAL	PARTIAL	NONE	NONE	NONE
DESIGN SPEED (km/h)	120	100-80	90-80	80-70	60-50	50	30
OPERATING SPEED (km/h)	100-80	80-70	70-60	60-50	50-30	50-30	30-20
MAXIMUM GRADE: UP (%) DOWN (%)	6 7	7 8	7 8	7 8	8	10	12
MINIMUM HORIZONTAL RADIUS OF CURVATURE (m)	500	300	250	200	150	75	30
HOURLY CAPACITY/LAND (VEHICLE/HOUR)	1500-800	1000-800	900-700	900-600	600-300	400-200	-
RIGHT OF WAY (m)	70	50	30	25	20	15	5
LANE WIDTH (m)	3.75 MINIMUM	3.75	3.5	3.5	3.0	2.75	2.5
DIVIDED FLOW	ALWAYS	USUALLY	FREQUENTLY	SOMETIMES	NOT USUALLY	NEVER	-
PARKING	PROHIBITED	PROHIBITED	PROHIBITED	INTERIM ONLY	PERMITTED OR INTERIM	PERMITTED	PROHIBITED
RELATED ELEMENTS	EMERGENCY LANES (SHOULDER), NO SIDEWALKS, NO SMALL MOTORCYCLES	EMERGENCY LANES, NO SIDEWALK, NO BICYCLE	EMERGENCY LANES NO SIDEWALK USUALLY, SEPARATED SIDEWALK MAY BE ALLOWED, NO BICYCLE	SIDEWALKS SEPARATED FROM PAVEMENT USUALLY	SIDEWALKS	SIDEWALKS	OPTIONAL
INTERSECTION TYPE	GRADE SEPARATED ALWAYS	GRADE SEPARATED IN GENERAL	GRADE SEPARATION OPTIONAL	SIGNALIZED	SIGNALIZED OR STOP SIGNS	STOP SIGN OR UNCONTROLLED	STOP SIGN OR UNCONTROLLED
DISTANCE BETWEEN INTERSECTIONS (m)	1,000 MINIMUM	400 MINIMUM	250 MINIMUM	200 MINIMUM	200 MINIMUM WHEN POSSIBLE	-	-
NORMAL NUMBER OF LANES	6-4 USUALLY	4 MINIMUM	4-2	4-2	2	2	1 or 2

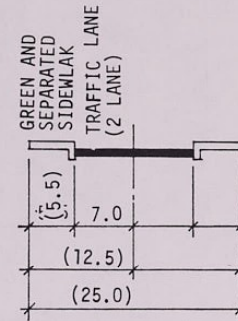
V<sub>1</sub> EXAMPLE  
(REGIONAL HIGHWAY)  
6 LANE



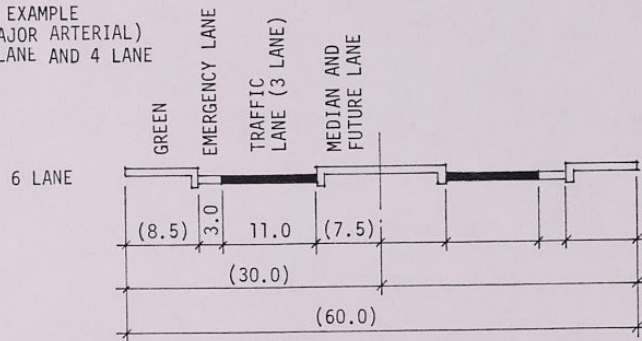
V<sub>3</sub> EXAMPLE  
(ARTERIAL)  
4 LANE



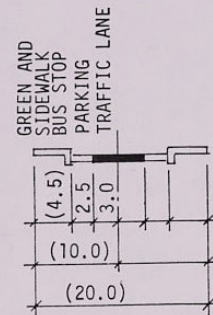
V<sub>4</sub> EXAMPLE  
(COLLECTOR)  
4 LANE



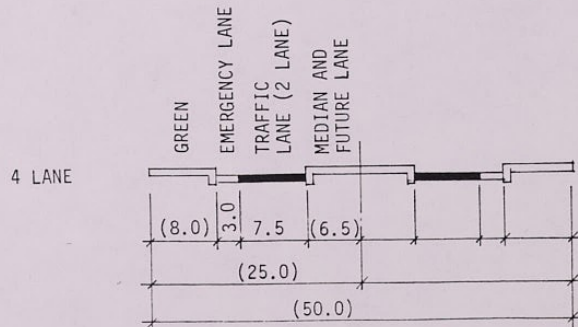
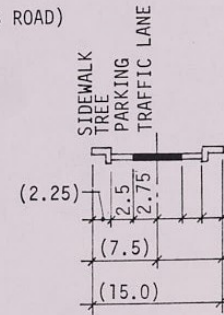
V<sub>2</sub> EXAMPLE  
(MAJOR ARTERIAL)  
6 LANE AND 4 LANE



V<sub>5</sub> EXAMPLE  
(DISTRIBUTOR)  
2 LANE



V<sub>6</sub> EXAMPLE  
(LOCAL ACCESS ROAD)  
2 LANE



NOTE: ( ) Dimensions can vary depending on the local condition and detail design, sometimes median strip and green zone can even be eliminated where elimination is justified by the detail planning.

FIGURE A-2-9 (b)  
ROAD SECTIONS BY  
CLASSIFICATION  
(EXAMPLE)

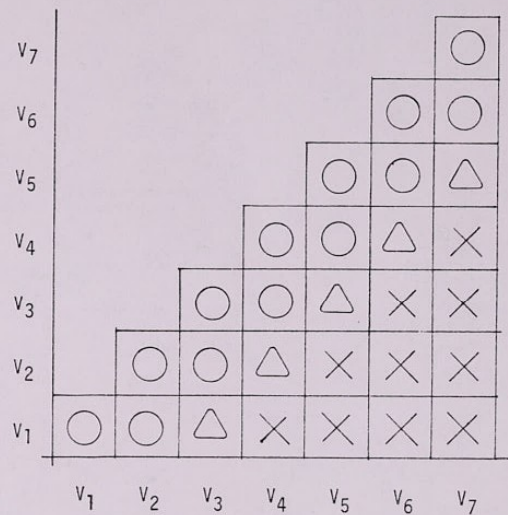
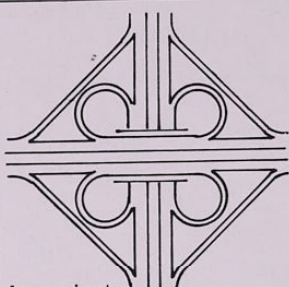
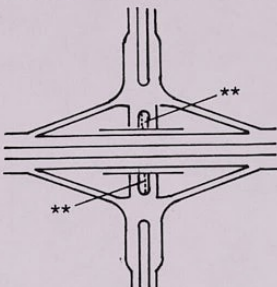
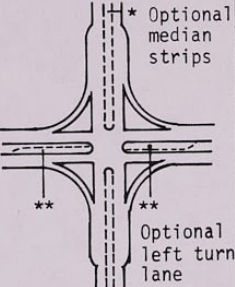
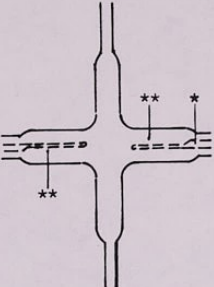
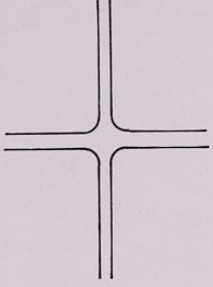
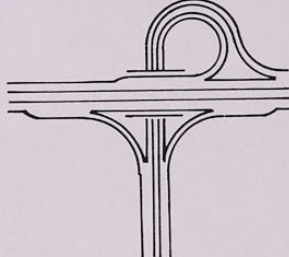
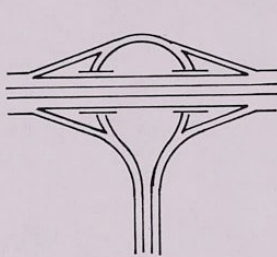
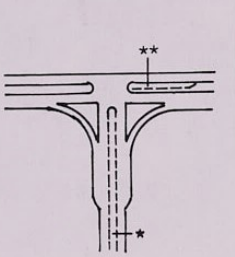
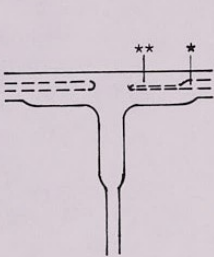
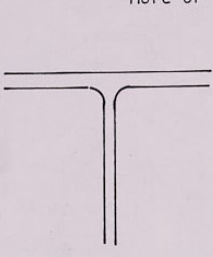


FIGURE A-2-9 (c)  
ALLOWABLE ROAD  
INTERCHANGES

NOTE: When two roads (with classification  $V_m$  and  $V_n$ ) intersect, then interchange ( $V_m/V_n$ ) is:

Allowed	when (○)	$ m-n  = 0$ or $1$
Not allowed	when (△)	$ m-n  = 3$
Allowed but not recommended	when (×)	$ m-n  = 2$

	Cloverleaf	Diamond	Channelized	Flaired	Common
Four leg Cross intersection	 <p>Approximate scale: 200-400 M</p>	 <p>100-200 M</p>	 <p>50-100 M</p>	 <p>50-100 M</p>	 <p>50 M More or less</p>
Three leg "Tee" intersection					
Basic characteristics of intersection	Vertical separation Flow separation Ramps Speed control	Vertical separation Flow control Ramps Speed control Signal/sign control	Flow control Traffic channels Signal control	Flow control Traffic channels Signal/sign control	Sign control or Uncontrolled
Types of roads intersecting	$V_1 / V_1$ ( $V_1$ intersecting $V_1$ ) $V_1 / V_2$ $V_2 / V_2$ $V_2 / V_3$	$V_2 / V_2$ $V_2 / V_3$ $V_3 / V_3$ $V_3 / V_4$	$V_3 / V_3$ $V_3 / V_4$ $V_4 / V_4$ $V_4 / V_5$	$V_4 / V_4$ $V_4 / V_5$ $V_5 / V_5$ $V_5 / V_6$	$V_5 / V_5$ $V_5 / V_6$ $V_6 / V_6$ $V_6 / V_7$

Note:  
Intersections shown above are "examples" only.  
Actual design should be based on detailed analysis  
of each case in each location.

\* Median strips may be eliminated, then  
roadway width can be decreased accordingly

\*\* Left turn lane may be provided  
for safer turn (optional)

FIGURE A-2-9(d)  
INTERSECTION  
EXAMPLES

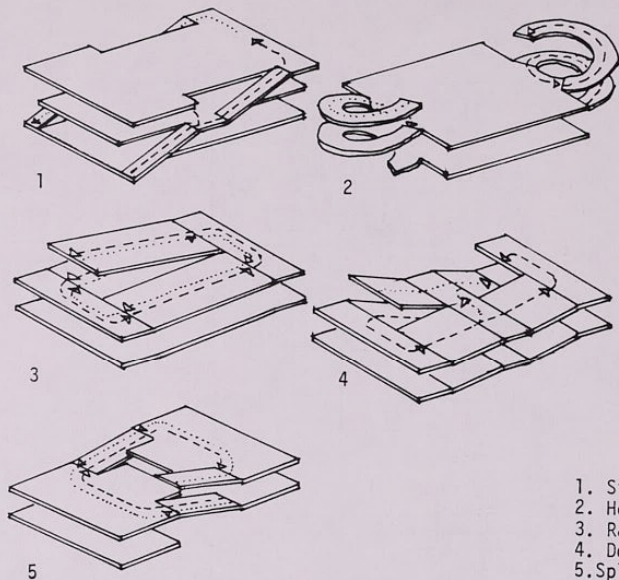


FIGURE A-2-9 (e)  
STRUCTURE PARKING  
(EXAMPLES)

1. Straight Ramp
2. Helical Ramp
3. Ramped Floor
4. Double Ramped Floor
5. Split-level Floor

Recommended Size

Minimum capacity	200 cars
Maximum capacity	500 cars
Maximum No. of Levels (for garage)	6

Unit Parking Dimensions

45° one-way	14.5 to 16.5 m.
60° one-way	17.0 to 19.0 m.
90° two-way	18.5 to 19.5 m.

Entrance and Exit

Number	At least one with multiple lanes, minimum 15 m from street intersection.
Width of lanes	3.5 m for one-way
Radius of Curb (inside)	Minimum 3.5 m.

Ramps and Driveways

Slope	15 per cent maximum.
Width	
Straight	Minimum 3.0 m.
Curved, inside lane	Minimum 3.5 m.
Curved, outside lane	Minimum 3.0 m.
Curvature	4 m. diameter to inside.

Parking Stalls

Length	5.5 m.
Width	2.5 m.

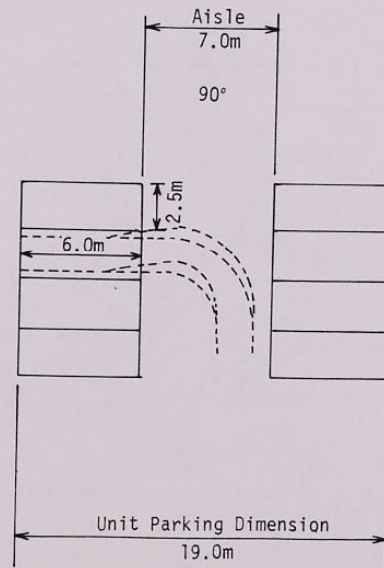
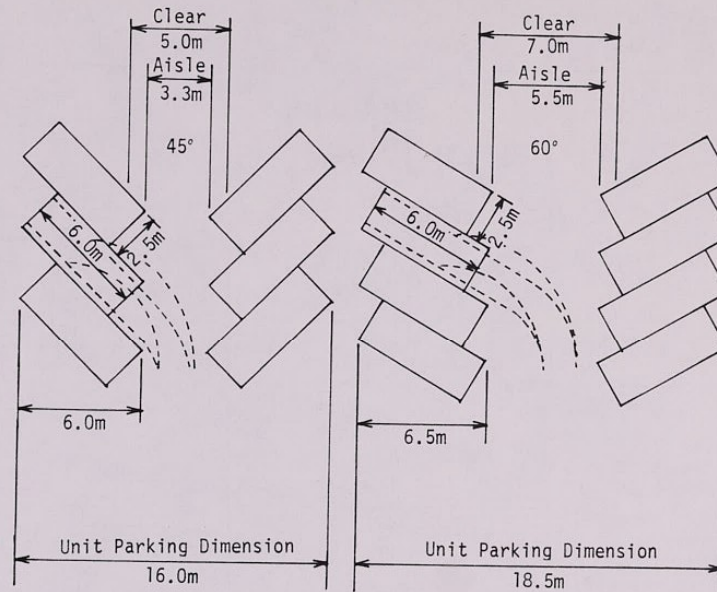


FIGURE A-2-9-(f)  
UNIT PARKING  
DIMENSION (EXAMPLES)

Table A-3-1(a)  
LAND AREA DISTRIBUTION FOR A PROTOTYPICAL CITY OF 60,000 INHABITANTS (in ha)

		NEIGHBORHOOD (3750 Inh)	SUB-COMM. (15,000 Inh)	COMMUNITY (30,000 Inh)	CITY TOTAL (60,000 Inh)	
(1) EDUCATIONAL FACILITIES	NURSERY-KINDERGARTEN	0.02x4=0.1	x4= 0.4	x2= 0.8	x2= 1.6	
	ELEMENTARY SCHOOL (BOYS)	0.5	x4= 2.0	x2= 4.0	x2= 8.0	
	ELEMENTARY SCHOOL (GIRLS)	0.5	x4= 2.0	x2= 4.0	x2= 8.0	
	INTERMEDIATE SCHOOL (BOYS)		1.2	x2= 2.4	x2= 4.8	
	INTERMEDIATE SCHOOL (GIRLS)		1.2	x2= 2.4	x2= 4.8	
	SECONDARY SCHOOL (BOYS)			1.5	x2= 3.0	
	SECONDARY SCHOOL (GIRLS)			0.9	x2= 1.8	
	TEACHERS SCHOOL				2.1	
	TECHNICAL SCHOOL (BOYS)				2.1	
	TECHNICAL SCHOOL (GIRLS)				1.0	
	COLLEGE WITH ATHLETIC FACILITIES				10.0	
	TOTAL (1)		1.1	6.8	15.6	46.7
	(2) RECREATIONAL/ATHLETIC FACILITIES (to be cont.)	TOT-LOT	0.5x16=0.8	x4=3.2	x2= 6.4	x2=12.8
NURSERY-KINDERGARTEN PLAY LOT		0.2x4=0.8	x4=3.2	x2= 6.4	x2=12.8	
NEIGHBORHOOD PARK		2.0	x4=8.0	x2=16.0	x2=32.0	
PLAYGROUND		1.5*	x4=6.0	x2=12.0	x2=24.0	
PLAYFIELD LEVEL 1			3.6**	x2= 7.2	x2=14.4	

NOTE: \* 0.75 ha for boy; 0.74 ha for girl  
\*\* 1.8 ha for boys; 1.8 ha for girls  
\*\*\* 2.0 ha for boy; 1.0 ha for girl

		NEIGHBORHOOD (3750 Inh)	SUB-COMM. (15,000 Inh)	COMMUNITY (30,000 Inh)	CITY TOTAL (60,000 Inh)
RECREATIONAL/ATHLETIC FACILITIES (CONT.)	COMMUNITY PARK	-	-	12.0	x2=24.0
	PLAYFIELD LEVEL 2	-	-	3.0***	x2= 6.0
	CITY PARK	-	-	-	24.0
TOTAL (2)		5.1	24.0	63.0	150.0
(3) CULTURAL COMMUNITY FACILITIES-RELIGIOUS, SOCIAL AND CULTURAL FACILITIES	SMALL MOSQUE	0.25	x4= 1.0	x2= 2.0	x2= 4.0
	NEIGHBORHOOD CENTER	0.3	x4= 1.2	x2= 2.4	x2= 4.8
	JAMI'A MOSQUE	-	0.7	x2= 1.4	x2= 2.8
	COMMUNITY CENTER	-	-	0.6	x2= 1.2
	CIVIC CENTER	-	-	-	3.0
TOTAL (3)		0.6	2.9	6.4	16.1
(4) HEALTH FACILITIES	PHARMACY	0.1	x4= 0.4	x2= 0.8	x2= 1.6
	DIAGNOSIS/TREATMENT CENTER	-	0.5	x2= 1.0	x2= 2.0
	GENERAL HOSPITAL	-	-	-	4.5
TOTAL (4)		0.1	0.9	1.8	8.1
(5) COMMERCIAL FACILITIES	NEIGHBORHOOD SHOPPING CENTER	1.2	x4= 4.8	x2= 9.6	x2= 19.2
	COMMUNITY SHOPPING CENTER	-	-	1.1	x2= 2.2
	DOWNTOWN SHOPPING	-	-	-	4.5
TOTAL (5)		1.2	4.8	10.7	25.9

Table A-3-1 (a) continued

		NEIGHBORHOOD (3750 Inh)	SUB-COMM. (15,000 Inh)	COMMUNITY (30,000 Inh)	CITY TOTAL (60,000 Inh)
(6) PUBLIC FACILITIES	GOVERNMENT OFFICE	-			2.6
	POST OFFICE	-		0.1	x2= 0.2
	POLICE STATION	-		0.1	x2= 0.2
	FIRE STATION	-		0.1	x2= 0.2
	WATER SUPPLY STATION	-	0.5	x2= 1.0	x2= 2.0
	SEWAGE TREATMENT	-	1.0	x2= 2.0	x2= 4.0
	POWER STATION	-	1.0	x2= 2.0	x2= 4.0
	GARBAGE DISPOSAL	-	1.0	x2= 2.0	x2= 4.0
	MUNICIPAL LIBRARY OR MUSEUM	-	0.2	x2= 0.4	x2= 0.8
TOTAL (6)		-	3.7	7.7	18.0
(7) INDUSTRIAL	FACTORY, WAREHOUSE DISTRIBUTION CENTER	-	10.0	x2=20.0	x2=40.0
TOTAL (7)			10.0	20.0	40.0
TOTAL of (1) through (7)		8.1	53.1	125.2	304.5
(8) RESIDENTIAL	CASE 1 100 pph NET DENSITY	37.5	x4= 150.0	x2= 300.0	x2= 600.0
	CASE 2 200 pph NET DENSITY	18.8	x4= 75.0	x2= 150.0	x2= 300.0
	CASE 3 400 pph NET DENSITY	9.4	x4= 37.5	x2= 75.0	x2= 150.0

		NEIGHBORHOOD (3750 INH)	SUB-COMM. (15,000 INH)	COMMUNITY (30,000 INH)	CITY TOTAL (60,000 INH)
TOTAL of (1) THROUGH (8)	CASE 1	45.6	203.1	425.2	904.5
	CASE 2	26.7	128.1	275.2	604.5
	CASE 3	12.5	90.6	200.2	454.5
(9) TRANSPORTATION	STREET/SIDE-WALK* CASE 1	9.1	x4=36.4	x2=72.8	x2=145.5
	CASE 2	5.3	x4=21.2	x2=42.4	x2= 84.8
	CASE 3	3.5	x4=14.0	x2=28.0	x2= 56.0
	ARTERIES** CASE 1	-	20.3	42.5	90.4
	CASE 2	-	12.8	27.5	60.4
	CASE 3	-	9.1	20.0	45.4
TOTAL (9)	CASE 1	9.1	56.7	115.3	236.5
	CASE 2	5.3	34.0	69.9	145.2
	CASE 3	3.5	23.1	48.0	101.4
GRAND TOTAL of (1) THROUGH (9)	CASE 1	54.7	259.8	540.5	1140.5
	CASE 2	32.0	162.1	345.1	749.7
	CASE 3	21.0	113.7	248.2	555.9

NOTES: \* Assumption: 20% of total of (1) through (8) for small streets  
 \*\* Assumption: 10% of total of (1) through (8) for arterials outside of neighborhood



Table A-3-1(b)  
 GENERAL STANDARDS FOR URBAN LAND DISTRIBUTION<sup>a</sup>  
 (% OF TOTAL AREA WITHOUT RESERVE  
 LAND, NON USED OR BUFFER AREAS)

	NEIGHBORHOOD (3750 INH.)			SUB-COMMUNITY (15,000 INH.)			COMMUNITY (30,000 INH.)			CITY (60,000 INH.)		
	Case 1	Case 2	Case 3	Case 1	Case 2	Case 3	Case 1	Case 2	Case 3	Case 1	Case 2	Case 3
(1)Educational*	2.0	3.4	5.2	2.6	4.2	6.0	2.9	4.5	6.3	4.1	6.2	8.4
(2)Recreational/ Athletic	9.3	15.9	24.3	9.2	14.8	21.1	11.7	18.3	25.4	13.2	20.0	27.0
(3)Cultural/ Religion and Social	1.1	1.9	2.9	1.1	1.8	2.6	1.2	1.9	2.6	1.4	2.1	2.9
(4)Health	0.2	0.3	0.5	0.3	0.6	0.8	0.3	0.5	0.7	0.7	1.1	1.5
(5)Commercial*	2.2	3.8	5.7	1.8	3.0	4.2	2.0	3.1	4.3	2.3	3.5	4.7
(6)Public Facility	-	-	-	1.4	2.3	3.3	1.4	2.2	3.1	1.6	2.4	3.2
(7)Industrial	-	-	-	3.8	6.2	8.8	3.7	5.8	8.1	3.5	5.3	7.2
(8)Residential	68.6	58.8	44.8	57.7	46.3	33.0	55.5	43.5	30.2	52.6	40.0	27.0
(9)Transportation	16.6	16.6	16.7	21.8	21.0	20.3	21.3	20.3	19.3	20.7	19.4	18.2

Note: a. Parking is included in each use category.  
 b. Case 1: 100 pph, NET RESIDENTIAL DENSITY  
 c. Case 2: 200 pph, NET RESIDENTIAL DENSITY  
 d. Case 3: 400 pph, NET RESIDENTIAL DENSITY  
 \* School athletic ie. palyground/playfield is excluded from this  
 category in this computation.





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